

Table 1. Sampling site description. The conditions and corresponding monthly intervals listed for each site represent the extremes in fresh water flow and algal production characteristic of each site. Each site and condition will be sampled at least twice during the three year field program (see Table 4 and Fig. 1).

Site	Habitat Type	Representative of:	Condition 1	Condition 2	Condition 3
① Sacramento R. at Prospect Island	Tidal River (Sacramento)	Deep Habitat of the Sacramento River; Freshwater Biota; Sport fishery	High Flow [Jan-Apr]	Low Flow [Aug-Sept]	
② Newly Flooded Prospect Island	Freshwater Shallows	Model for Restored Shallow Water Habitat; freshwater biota	High Flow [Jan-Apr]	Low Flow [Aug-Sept]	
③ Yolo Bypass	Seasonal Wetland	Potential Site for Permanent Flooding; potential high activity	Dry [June-Oct]	Flooded [Jan-Apr of wet years]	
④ Suisun Bay at Ryer Island	Brackish/Low Salinity Estuary	Critical Nursery Habitat; Estuarine Biota; Sport fishery	High Flow [Jan-Apr]	Low Flow [Aug-Sept]	
⑤ Montezuma Slough	Brackish/Low Salinity Marsh	Critical Nursery Habitat Influenced by Marsh Exchanges; Estuarine Biota	High Flow [Jan-Apr]	Low Flow [Aug-Sept]	
⑥ Central Delta at IEP site D26	Tidal River (San Joaquin)	Deep Habitat of the San Joaquin River and Central Delta; Freshwater Biota; Sport fishery	Low Algal Biomass [Jan-Mar]	High Algal Biomass [June-Aug]	
⑦ Eastern San Pablo Bay	High Salinity Estuary	Deep Estuarine Habitat; Estuarine and Marine Biota; Sport fishery	High Flow [Jan-Apr]	Low Flow [Aug-Sept]	High Algal Biomass [May-June]
⑧ Richardson Bay	Coastal Marine	Coastal Habitat Influenced by Bay-Delta Processes; Marine Biota	High Flow [Jan-Apr]	Low Flow [Aug-Sept]	
⑨ South Bay at Redwood Ck.	Urbanized Marine	Deep Estuarine Habitat Strongly Influenced by Phytoplankton Blooms; Sport fishery	Low Algal Productivity [Nov-Jan]	High Algal Productivity [Mar-Apr]	Algal Bloom Termination [Apr-May]

Table 2. Organisms at the food web base of the San Francisco Bay estuary to be collected as part of the proposed USGS Mercury field sampling program.

Feeding Mode	Species Type	Examples
Pelagic suspension feeders	calanoid copepods	<u>Eurytemora</u> , <u>Acartia</u> , <u>Pseudodiaptomus</u> , <u>Sinocalanus</u>
	cladocerans	<u>Daphnia</u> , <u>Diaphanosoma</u> , <u>Bosmina</u>
Pelagic carnivores	cyclopoid copepods	<u>Cyclops</u> , <u>Limnithona</u>
	larval fish	
Benthic suspension/deposit feeders	bivalve molluscs	<u>Potamocorbula</u> , <u>Corbicula</u> , <u>Mya</u> , <u>Tapes</u> , <u>Macoma</u>
	amphipods	<u>Corophium</u> , <u>Ampelisca</u>
	polychaete worms	<u>Streblospio</u> , <u>Heteromastus</u> , <u>Asychis</u> , <u>Capitella</u>
Benthic carnivores	polychaete or annelid worms	<u>Nereis</u> , <u>Limnodrilus</u>
Epibenthic herbivores/omnivores	mysid shrimp	<u>Neomysis</u> , <u>Acanthomysis</u>
	harpacticoid copepods	
Epibenthic carnivores	bay shrimp	<u>Crangon</u> , <u>Palaemon</u>
	crabs	<u>Cancer</u> , <u>Hemigrapsus</u>
Intertidal grazers	gastropods	<u>Ilyanassa</u>

Table 3. Fish Sampling Design. The temporal and spatial variability of Hg (and Se) contamination in fish of various trophic levels will be determined by sampling five distinct geographic Bay areas for the fish species indicated. The primary sampling effort will be targeted for species designated with (*) . The additional species listed may be collected when available to supplement our broad spectrum food web analysis and to compare Hg contamination among species within a given trophic level . Fish sampling will be conducted during the periods indicated in Table 4. For each species*/region n=10-20. Adults of species in brackets [] use the Bay/Delta primarily as a migratory corridor and may not accurately reflect the bioavailability of Hg in the local environment.

TROPHIC LEVEL	DELTA	SUISUN BAY	SAN PABLO BAY	CENTRAL BAY	SOUTH BAY
Planktivore (forage on zooplankton)	Longfin smelt* Delta smelt Threadfin shad	Longfin smelt* Delta smelt	Longfin smelt* Northern anchovy	Longfin smelt* Northern anchovy	Longfin smelt* Northern anchovy
Benthic Feeder / Primary Consumer (Forage on plants or detritus)		Jacksmelt	Jacksmelt	Topsmelt Jacksmelt	Topsmelt Jacksmelt
Benthic Feeder / Secondary & Tertiary Consumers (Forage on invertebrates)	Staghorn sculpin* Striped bass (juvenile)* Starry flounder Yellowfin goby White sturgeon Green sturgeon Splittail Chinook salmon (juvenile) Steelhead (juvenile)	Staghorn sculpin* Striped bass (juvenile)* Starry flounder Yellowfin goby White sturgeon Green sturgeon Splittail Shiner perch Leopard shark White croaker Chinook salmon (juvenile) Steelhead (juvenile)	Staghorn sculpin* Striped bass (juvenile)* Starry flounder Yellowfin goby White sturgeon Green sturgeon Splittail Shiner perch Leopard shark White croaker Chinook salmon (juvenile) Steelhead (juvenile)	Staghorn sculpin* Striped bass (juvenile)* Starry flounder Yellowfin goby White sturgeon Green sturgeon Shiner perch Leopard shark White croaker Chinook salmon (juvenile) Steelhead (juvenile)	Staghorn sculpin* Striped bass (juvenile)* Starry flounder Yellowfin goby White sturgeon Green sturgeon Shiner perch Leopard shark White croaker Steelhead (juvenile)
Piscivore (forage on fish)	Striped bass (subadult & adult)* [Chinook salmon (adult)] [Steelhead-(adult)]	Striped bass (subadult & adult)* [Chinook salmon (adult)] [Steelhead (adult)]	Striped bass (subadult & adult)* [Chinook salmon (adult)] [Steelhead (adult)]	Striped bass (subadult & adult)* [Chinook salmon (adult)] [Steelhead (adult)]	Striped bass (subadult & adult)* [Steelhead (adult)]

Table 4. Project Schedule

Task	1998				1999				2000			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Field Sampling ^a	7&9	1-7	9	1-7	7&9	1-7	9	1-7	1-9 (as needed)			
Fish Sampling ^b		x		x		x			x			
Transect Cruise ^c		x		x								
Benthic Flux ^d		x		x		x		x	x			
Analytical ^e	x				x				x			
Flooding Simulation ^f		x			x				x			
Hg/MeHg Uptake ^{g,h}		x			x				x			
Se-Hg Exper. ^{g,h}		x			x				x			
HgS Dissolution ^g		x			x				x			
MeHg ^g Photodegradation			x		x		x					
Hg ⁰ Production ^g			x		x		x					
Annual Report				x				x				
Final Report												x

^a Field Sampling : collection of sediment, water and invertebrates for Hg/MeHg analysis; benthic microbial rate assays / Numbers refer to sites given in Table 1.

^b Fish Sampling: conducted by the California Dept. of Fish and Game, see Table 3 for species and regions of collection.

^c Transect Cruise: includes primary field sites plus additional locations along the estuarine salinity gradient (see Fig. 1).

^d Benthic flux measurements: conducted at a subset of primary sampling locations.

^e Includes analysis of all Hg species, Se, stable isotopes, DOC, etc... in all samples collected during the field component.

^f Laboratory mesocosm experiments conducted with soil collected from proposed wetlands restoration sites and the Yolo Bypass.

^g laboratory experiments

^h Experiments with invertebrate organisms at the food web base.

Table 5. Budget Summary - Based on detailed investigator group budgets given in Appendix A. Tasks corresponding to specific investigator groups are given in Table 6.

Investigator Group	Funding Agency	Direct Salary & Benefits ¹	Materials ²	Other Direct Costs ³	Indirect Costs ⁴	Total Costs
I	USGS	85,765	30,000	7,500	69,644	192,909
II	USGS	137,477	37,500	8,000	103,382	286,359
III	USGS	120,164	0	6,500	71,565	198,229
IV	USGS	172,869	18,000	20,000	119,141	330,010
V	USGS	42,451	31,500	0	41,782	115,733
VI	USGS	49,305	12,000	0	34,638	95,943
VII	USGS	22,538	15,000	7,500	25,446	70,484
VIII	USGS	0	96,000	0	54,579	150,579
Boat-1 ⁵	USGS	34,125	17,500	2,500	30,581	84,706
Total USGS Contribution =						\$1,524,952
Percent of Total Cost =						28.6%
IX	CDFG	20,124	3,920	1,920	5,972	31,936
Total CDFG Contribution =						\$28,738
Percent of Total Cost =						0.6%
I	CALFED	342,036	42,500	17,500	227,150	629,186
II	CALFED	381,350	25,000	6,000	232,978	645,328
III	CALFED	236,487	22,000	16,000	155,085	429,572
IV	CALFED	227,560	36,500	42,500	173,206	479,766
V	CALFED	332,280	32,625	32,000	224,251	621,156
VI	CALFED	99,382	18,000	12,000	73,100	202,482
VII	CALFED	168,985	38,000	6,000	120,336	333,321
VIII	CALFED	120,747	18,050	1,500	79,268	219,565
IX	CALFED	0	0	4,065	935	5,000
Boat-2 ⁶	CALFED	112,214	16,500	10,000	78,373	217,087
Total CALFED Funding Requested =						\$3,782,463
Percent of Total Cost =						70.8%
Project Total Cost =						\$5,339,351

¹ From Sections A and B in detailed budgets; Appendix A.

² From Sections C and D in detailed budgets; Appendix A.

³ From Sections E, F and G in detailed budgets; Appendix A.

⁴ From Section J in detailed budgets; Appendix A.

⁵ Funds for boat time on the R/V Polaris (USGS), see detailed budget: Boat-1

⁶ Funds for boat time on the R/V Frontier (USGS) and one full time position, see detailed budget: Boat-2

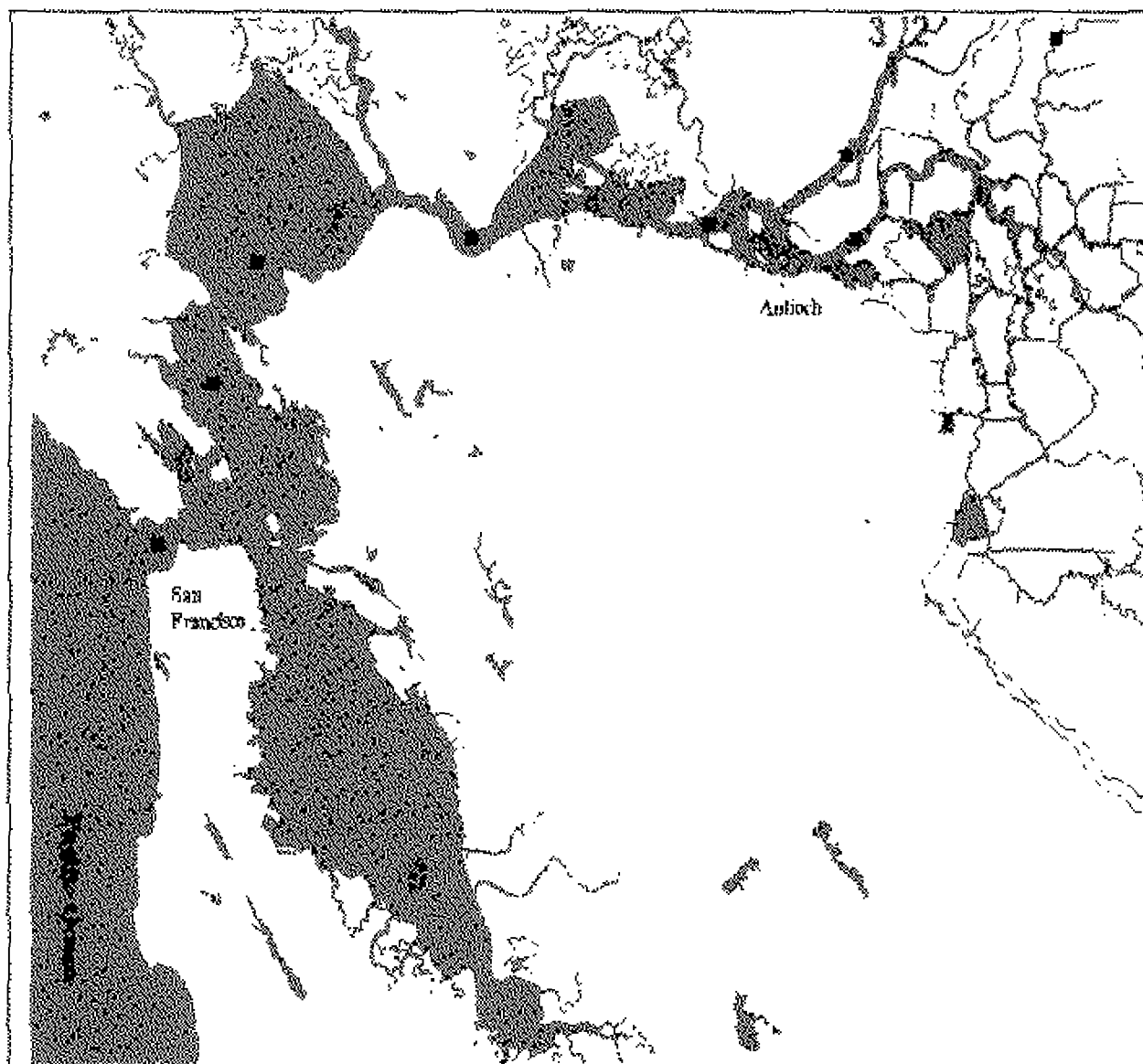
Table 6. Project involvement of investigator groups. Roman numeral for group corresponds to summary budget groups (Table 5). Detailed budgets for each group are given in Appendix A. Individual investigator biographies are given in Appendix B.

GROUP	INVESTIGATOR(S)	PROJECT INVOLVEMENT
I	Mark Marvin-DiPasquale (Microbial Ecologist) Laurence Miller (Oceanographer) Ronald Oremland (WRD Project Chief) USGS - Menlo Park, CA	microbial Hg-methylation and MeHg-degradation rates, benthic microbial processes (sulfate reduction and methanogenesis), sediment and porewater characterization (redox, nutrients, DOC, DIC); Hg remobilization in restored wetlands - mesocosm experiments
II	Samuel Luoma (WRD Project Chief) Byeong-Gweon Lee (Biogeochemist) Robin Bouse (title) USGS - Menlo Park, CA	sediment origin geochemical signature assessment; Hg uptake by invertebrates - laboratory experiments; Se-Hg interactions at the food web base - laboratory experiments; sediment and water column Se analysis
III	James Cloern (WRD Project Chief) USGS - Menlo Park, CA	trophic dynamics / food web assessment, water column and surface sediment characterization, benthic/pelagic invertebrate collection and characterization
IV	James Kuwabara (WRD Project Chief) USGS - Menlo Park, CA George Aiken (WRD Project Chief) USGS - Boulder, CO	dissolved Hg benthic flux; Hg complexation reactions with dissolved organic carbon and sulfur ligands; dissolved organic matter characterization
V	David Krabbenhoft (WRD Project Chief) USGS - Madison, WI	Hg speciation analysis in water, sediment and biota; photochemical MeHg degradation and Hg ⁺² reduction (dissolved gaseous Hg ⁰ production) experiments
continued....		

Table 6. (continued)

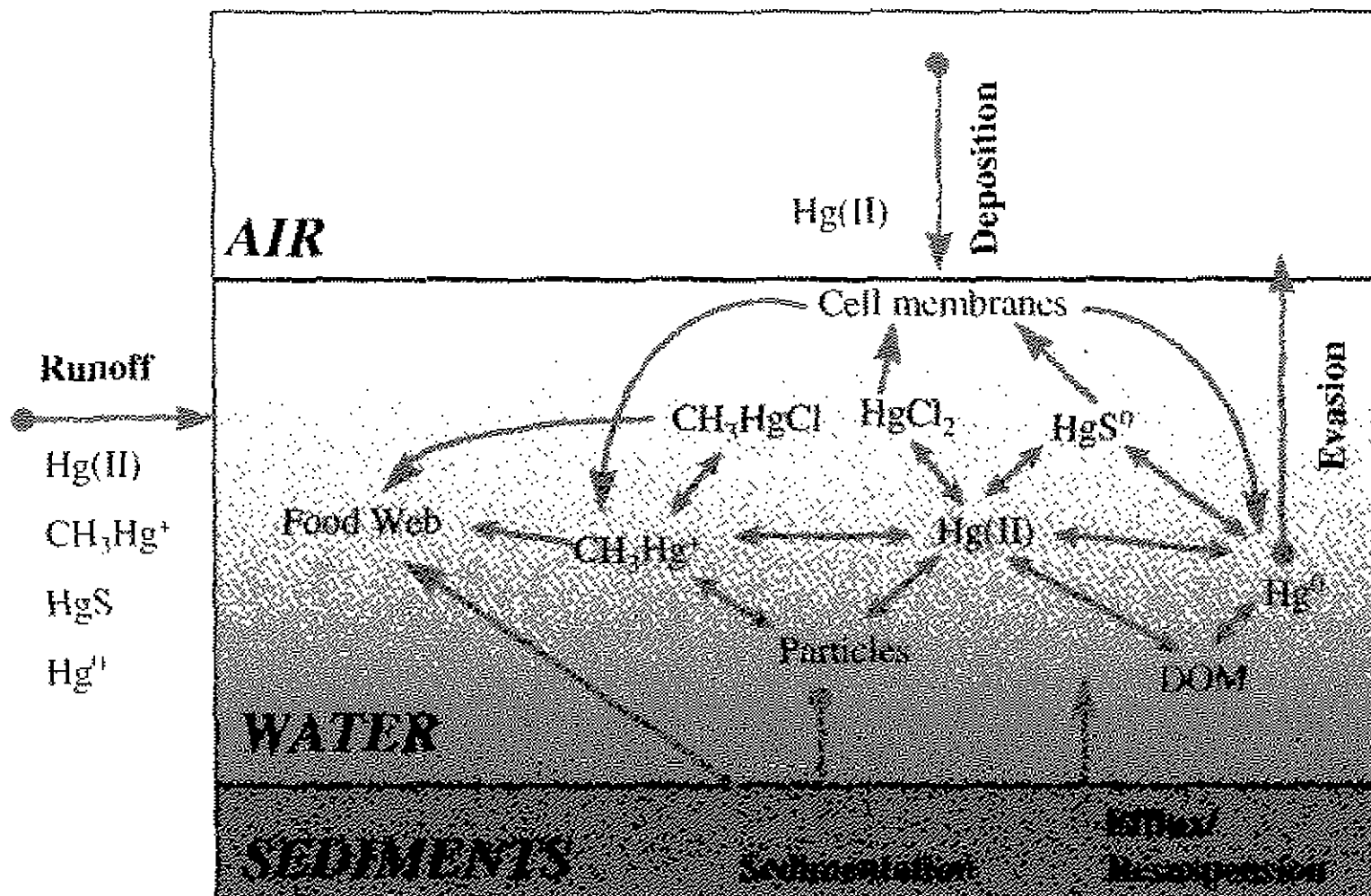
GROUP	INVESTIGATOR(S)	PROJECT INVOLVEMENT
VI	Michael Saiki (Fisheries Biologist) USGS-BRD, Dixon, CA	bioaccumulation of Hg in fish, fish collection coordinator; fish gut content analysis; tissue preparation
VII	Carol Kendall (WRD Project Chief) USGS - Menlo Park, CA	stable isotope analysis; trophic dynamics / food web assessment
VIII	Thomas May (Research Chemist) USGS-BRD Columbia, MO	bioaccumulation of Hg in fish; Total Hg and Se analysis in fish tissue
IX	Chuck Armor CA Dept. of Fish and Game Stockton, CA	Fish collection

Figure 1. Locations of sampling sites for assessment of mercury concentrations in water, sediments, seston, and biota. Numbers indicate primary sampling sites. Black squares indicate additional sites to be sampled (water and sediment only) during the two 1998 transect cruises. See Table 1 for site descriptions.



① Sacramento River at Rio Vista; ② Shallows at Prospect Island; ③ Yolo Bypass; ④ Suisun Bay at Ryer Island; ⑤ Montezuma Slough; ⑥ San Joaquin River at IEP station D26; ⑦ Eastern San Pablo Bay; ⑧ Richardson Bay; ⑨ South San Francisco Bay

Figure 2. A generalized model of the mercury cycle in aquatic systems.



APPENDIX A.

Detailed Budgets for Individual Investigator Groups

**APPENDIX A. Detailed Budget
Investigator Group: I**

Funds Contributed by the USGS

	<u>% Effort</u>	<u>YEAR 1 (97-'98)</u>	<u>YEAR 2 (98-'99)</u>	<u>YEAR 3 (99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigator(s)					
a. Ronald Oremland (GS 15)	5 of 10	6,700	6,700	6,700	20,100
b. Laurence Miller (GS 13)	20 of 25	13,169	13,545	13,922	40,636
2. Others					
a. Allana Burns (GS 9)	5 of 10	1,691	1,746	1,800	5,237
TOTAL SALARIES		21,560	21,991	22,422	65,973
B. BENEFITS					
1. Principal Investigator(s)					
a. Ronald Oremland (GS 15)		1,005	1,005	1,005	6,030
b. Laurence Miller (GS 13)		3,951	4,064	4,176	12,191
2. Others					
a. Allana Burns (GS 9)		507	524	540	1,571
TOTAL BENEFITS		5,463	5,592	5,721	19,792
C. PERMANENT EQUIPMENT*		10,000	10,000	5,000	30,000
D. EXPENDABLES		0	0	0	0
E. TRAVEL		0	0	0	0
F. PUBLICATIONS		0	0	0	0
G. OTHER COSTS					
a. Vehicles: (lab truck & suburban)		3,000	3,000	1,500	7,500
TOTAL OTHER COSTS		3,000	3,000	1,500	7,500
I. TOTAL DIRECT COSTS (A-G)		40,023	40,583	34,643	123,265
J. INDIRECT COSTS (@ 56.5 % of direct costs)		22,613	22,929	19,573	69,644
K. TOTAL COSTS (I +J)		62,636	63,513	54,216	192,909

* In-kind contribution of existing equipment

APPENDIX A. Detailed Budget Funds Contributed by the USGS
Investigator Group: II

	<u>% Effort</u>	<u>YEAR 1</u> <u>('97-'98)</u>	<u>YEAR 2</u> <u>('98-'99)</u>	<u>YEAR 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigator(s)					
a. Samual Luoma (GS 15)	15 of 20	16,230	16,230	16,230	48,690
2. Others					
a. Michelle Hornberger (GS 11)	35 of 40	15,120	15,120	15,120	45,360
b. Cynthia Brown (GS 11)	15 of 20	6,480	6,480	6,480	19,440
TOTAL SALARIES		37,830	37,830	37,830	113,490
B. BENEFITS					
1. Principal Investigator(s)					
a. Samual Luoma (GS 15)		1,948	1,948	1,948	5,843
2. Others					
a. Michelle Hornberger (GS 11)		4,234	4,234	4,234	12,701
b. Cynthia Brown (GS 11)		1,814	1,814	1,814	5,443
TOTAL BENEFITS		7,996	7,996	7,996	23,987
C. PERMANENT EQUIPMENT*		15,000	15,000	7,500	37,500
D. EXPENDABLES		0	0	0	0
E. TRAVEL		0	0	0	0
F. PUBLICATIONS		2,000	3,000	3,000	8,000
G. OTHER COSTS					
TOTAL OTHER COSTS		0	0	0	0
I. TOTAL DIRECT COSTS (A-G)		62,826	63,826	56,326	182,977
J. INDIRECT COSTS (@ 56.5% of direct costs)		35,496	36,061	31,824	103,382
K. TOTAL COSTS (I +J)		98,322	99,887	88,150	286,359

* In-kind contribution of existing equipment

**APPENDIX A. Detailed Budget
Investigator Group: III**

Funds Contributed by the USGS

	<u>% Effort</u>	<u>YEAR 1 ('97-'98)</u>	<u>YEAR 2 ('98-'99)</u>	<u>YEAR 3 ('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigator(s)					
a. James Cloern (GS 15)	15 of 20	15,757	16,229	16,716	48,702
2. Others					
a. Jody Edmunds (GS 9)	15 of 20	5,394	5,556	5,723	16,673
b. Brian Cole (GS 13)	15 of 20	10,754	11,077	11,410	33,241
TOTAL SALARIES		31,905	32,862	33,848	98,615
B. BENEFITS					
1. Principal Investigator(s)					
a. James Cloern (GS 15)		2,127	2,191	2,257	6,575
2. Others					
a. Jody Edmunds (GS 9)		1,618	1,667	1,717	5,002
b. Brian Cole (GS 13)		3,226	3,323	3,423	9,972
TOTAL BENEFITS		6,972	7,181	7,396	21,549
C. PERMANENT EQUIPMENT					0
D. EXPENDABLES					0
E. TRAVEL					0
F. PUBLICATIONS		1,000	2,500	3,000	6,500
G. OTHER COSTS					
I. TOTAL DIRECT COSTS (A-G)		39,877	42,543	44,245	126,664
J. INDIRECT COSTS (@ 56.5% of direct costs)		22,530	24,037	24,998	71,565
K. TOTAL COSTS (I +J)		62,407	66,579	69,243	198,229

APPENDIX A. Detailed Budget
Investigator Group: IV

Funds Contributed from the USGS

	<u>%Effort</u>	<u>Year 1</u> <u>('97-'98)</u>	<u>Year 2</u> <u>('98-'99)</u>	<u>Year 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigators					
a. George Aiken (Chemist, GS 14)	25 of 30	18,291	18,820	18,820	55,931
b. James Kuwabara (Hydrologist, GS 14)	25 of 30	19,828	19,828	20,379	60,035
2. Others					
a. Brent Topping (Hydrologist, GS7)	25 of 30	6,850	7,071	7,291	21,212
b. Janece Koleis (Hydrologist, GS7)	15 of 20	3,425	3,535	3,646	10,606
TOTAL SALARIES		48,394	49,254	50,136	147,784
B. BENEFITS					
1. Principal Investigators					
a. George Aiken (Chemist, GS 14)		2,451	2,522	2,522	7,495
b. James Kuwabara (Hydrologist, GS 14)		2,657	2,657	2,731	8,045
2. Others					
a. Brent Topping (Hydrologist, GS7)		2,055	2,121	2,187	6,364
b. Janece Koleis (Hydrologist, GS7)		1,027	1,061	1,094	3,182
TOTAL BENEFITS		8,190	8,361	8,534	25,085
C. PERMANENT EQUIPMENT		8,000	-	-	8,000
D. EXPENDABLES		4,000	4,000	2,000	10,000
E. TRAVEL (Personnel and equipment)		1,000	1,000	2,000	4,000
F. PUBLICATIONS					
	Kuwabara >	500	500	1,000	2,000
	Aiken >	1,000	1,000	1,000	3,000
G. OTHER					
a. analytical expenses		5,000	5,000	1,000	11,000
I. TOTAL DIRECT COSTS (A-G)		76,084	69,115	65,670	210,869
J. INDIRECT COSTS (56.5% of direct costs)		42,987	39,050	37,104	119,141
K. TOTAL USGS CONTRIBUTIONS (I + J)		119,072	108,165	102,774	330,010

APPENDIX A. Detailed Budget
Investigator Group: V

Funds Contributed by the USGS

	<u>% Effort</u>	<u>YEAR 1</u> <u>('97-'98)</u>	<u>YEAR 2</u> <u>('98-'99)</u>	<u>YEAR 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigator(s)					
a. David Krabbenhoft (GS 14)	10%	7,248	7,466	7,689	22,403
2. Others					
a. Jim Hurley (Univ. of Wisc.)	5%	3,750	3,788	3,825	11,363
TOTAL SALARIES		10,998	11,254	11,514	33,766
B. BENEFITS					
1. Principal Investigator(s)					
a. David Krabbenhoft (GS 14)		1,450	1,493	1,538	4,481
2. Others					
a. Jim Hurley (Univ. of Wisc.)		1,388	1,402	1,415	4,204
TOTAL BENEFITS		2,837	2,895	2,953	8,685
C. PERMANENT EQUIPMENT*		10,500	10,500	10,500	31,500
D. EXPENDABLES					0
E. TRAVEL					0
F. PUBLICATIONS					0
G. OTHER COSTS					0
L TOTAL DIRECT COSTS (A-G)		24,335	24,649	24,967	73,951
J. INDIRECT COSTS (@56.5% of direct costs)		13,749	13,927	14,106	41,782
K. TOTAL COSTS (I +J)		38,084	38,575	39,073	115,733

* In-kind contribution of existing equipment

APPENDIX A. Detailed Budget
Investigator Group: VI

Funds Contributed by the USGS

	<u>% Effort</u>	<u>YEAR 1</u> <u>('97-'98)</u>	<u>YEAR 2</u> <u>('98-'99)</u>	<u>YEAR 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigator(s)					
a. M.K. Saiki	20 of 25	13,734	14,284	14,856	42,874
TOTAL SALARIES		13,734	14,284	14,856	42,874
B. BENEFITS					
1. Principal Investigator(s)					
a. M.K. Saiki		2,060	2,143	2,228	6,431
TOTAL BENEFITS		2,060	2,143	2,228	6,431
C. PERMANENT EQUIPMENT*		7,500	0	0	7,500
D. EXPENDABLES		1,500	1,500	1,500	4,500
E. TRAVEL					0
F. PUBLICATIONS					0
G. OTHER COSTS					0
I. TOTAL DIRECT COSTS (A-G)		24,795	17,927	18,584	61,306
J. INDIRECT COSTS (@ 56.5 % of direct costs)		14,009	10,129	10,500	34,638
K. TOTAL COSTS (I +J)		38,803	28,055	29,085	95,943

* In-kind contribution of existing equipment

APPENDIX A. Detailed Budget
Investigator Group: VII

Funds Contributed by the USGS

	<u>% Effort</u>	<u>YEAR 1</u> <u>('97-'98)</u>	<u>YEAR 2</u> <u>('98-'99)</u>	<u>YEAR 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigator(s)					
a. Carol Kendall (Hydrologist, GS-14)	5 of 10	3,952	4,070	4,192	12,214
2. Others					
a. Cecily Chang (Hydrologist, GS-12)	5 of 10	2,667	2,747	2,829	8,242
TOTAL SALARIES		6,618	6,817	7,021	20,456
B. BENEFITS					
1. Principal Investigator(s)					
a. Carol Kendall (Hydrologist, GS-14)		407	419	432	1,258
2. Others					
a. Cecily Chang (Hydrologist, GS-12)		267	275	283	824
TOTAL BENEFITS		674	694	715	2,082
C. PERMANENT EQUIPMENT*		5,000	5,000	5,000	15,000
D. EXPENDABLES					
E. TRAVEL					
F. PUBLICATIONS		2,000	2,500	3,000	7,500
G. OTHER COSTS					
I. TOTAL DIRECT COSTS (A-G)		14,292	15,010	15,736	45,038
J. INDIRECT COSTS (@ 56.5% of direct costs)		8,075	8,481	8,891	25,446
K. TOTAL COSTS (I +J)		22,366	23,491	24,626	70,484

* In-kind contribution of existing equipment

APPENDIX A. Detailed Budget
Investigator Group: VIII

Funds Contributed by the USGS

	<u>% Effort</u>	<u>YEAR 1</u> <u>('97-'98)</u>	<u>YEAR 2</u> <u>('98-'99)</u>	<u>YEAR 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
TOTAL SALARIES		0	0	0	0
B. BENEFITS					
TOTAL BENEFITS		0	0	0	0
C. PERMANENT EQUIPMENT*		52,500	26,600	17,500	96,600
D. EXPENDABLES					
E. TRAVEL					0
F. PUBLICATIONS					0
G. OTHER COSTS					0
L TOTAL DIRECT COSTS (A-G)		52,500	26,600	17,500	96,600
J. INDIRECT COSTS (@ 56.5% of direct cost)		29,663	15,029	9,888	54,579
K. TOTAL COSTS (I +J)		82,163	41,629	27,388	151,179

* In-kind contribution of existing equipment

**APPENDIX A. Detailed Budget
Investigator Group: IX**

Contributions from CA Dept. of Fish and Game

	<u>% Effort</u>	<u>YEAR 1 ('97-'98)</u>	<u>YEAR 2 ('98-'99)</u>	<u>YEAR 3 ('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigator(s)					
a. Charles Armor	5	4,500	2,250	2,250	9,000
2. Others					
a. Boat Operator	3	1,408	704	704	2,816
b. Deckhand	3	1,104	552	552	2,208
c. Crew	3	728	364	364	1,456
TOTAL SALARIES		7,740	3,870	3,870	15,480
B. BENEFITS					
1. Principal Investigator(s)					
a. Charles Armor		1,395	698	698	2,700
2. Others					
a. Boat Operator		422	211	211	845
b. Deckhand		331	166	166	662
c. Crew		218	109	109	437
TOTAL BENEFITS		2,367	1,184	1,184	4,644
C. PERMANENT EQUIPMENT*		1,000	500	500	2,000
D. EXPENDABLES		960	480	480	1,920
E. TRAVEL		160	80	80	320
F. PUBLICATIONS					0
G. OTHER COSTS		800	400	400	1,600
I. TOTAL DIRECT COSTS (A-G)		13,027	6,514	6,514	25,964
J. INDIRECT COSTS (@ 23% of direct costs)		2,996	1,498	1,498	5,972
K. TOTAL COSTS (I +J)		16,023	8,012	8,012	31,936

* In-kind contribution of existing equipment

APPENDIX A. Detailed Budget
Investigator Group: Boat-1

Funds Contributed by the USGS
The R/V Polaris

	<u>% Effort</u>	<u>YEAR 1</u> <u>('97-'98)</u>	<u>YEAR 2</u> <u>('98-'99)</u>	<u>YEAR 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
a. Boat Operator	5	4,500	4,500	2,250	11,250
b. crew	5	6,000	6,000	3,000	15,000
TOTAL SALARIES		10,500	10,500	5,250	26,250
B. BENEFITS					
a. Boat Operator		1,350	1,350	675	3,375
b. crew		1,800	1,800	900	4,500
TOTAL BENEFITS		3,150	3,150	1,575	7,875
C. PERMANENT EQUIPMENT*		2,000	2,000	1,000	5,000
D. EXPENDABLES		5,000	5,000	2,500	12,500
E. TRAVEL					0
F. PUBLICATIONS					0
G. OTHER COSTS		1,000	1,000	500	2,500
I. TOTAL DIRECT COSTS (A-G)		21,650	21,650	10,825	54,125
J. INDIRECT COSTS (@ 56.5% of direct costs)		12,232	12,232	6,116	30,581
K. TOTAL COSTS (I +J)		33,882	33,882	16,941	84,706

* In-kind contribution of existing equipment

APPENDIX A. Detailed Budget
Investigator Group: I

Funds Requested From CALFED

	<u>% Effort</u>	<u>YEAR 1</u> <u>('97-'98)</u>	<u>YEAR 2</u> <u>('98-'99)</u>	<u>YEAR 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigator(s)					
a. Ronald Oremland (GS 15)	5 of 10	6,700	6,700	6,700	20,100
b. Mark Marvin-DiPasquale (GS 11)	100	48,842	50,162	51,482	150,486
c. Laurence Miller (GS 13)	5 of 25	6,585	6,773	6,961	20,318
2. Others					
a. Technician (GS 5)	100	21,601	22,321	23,042	66,964
b. Allana Burns (GS 9)	5 of 10	1,691	1,746	1,800	5,237
TOTAL SALARIES		85,419	87,701	89,985	263,105
B. BENEFITS					
1. Principal Investigator(s)					
a. Ronald Oremland (GS 15)		2,010	2,010	2,010	6,030
b. Mark Marvin-DiPasquale (GS 11)		14,653	15,049	15,445	45,146
c. Laurence Miller (GS 13)		1,975	2,032	2,088	6,095
2. Others					
a. Technician (GS 5)		6,480	6,696	6,913	20,089
b. Allana Burns (GS 9)		507	524	540	1,571
TOTAL BENEFITS		25,626	26,310	26,995	78,931
C. PERMANENT EQUIPMENT		5,000	-	-	5,000
D. EXPENDABLES		15,000	15,000	7,500	37,500
E. TRAVEL		5000	5000	2500	12,500
F. PUBLICATIONS		1000	2000	2000	5,000
G. OTHER COSTS					
a. Vehicles: (lab truck & suburban)		USGS	USGS	USGS	USGS
TOTAL OTHER COSTS		0	0	0	0
I. TOTAL DIRECT COSTS (A-G)		137,044	136,012	128,980	402,036
J. INDIRECT COSTS (@ 56.5 % of direct costs)		77,430	76,847	72,874	227,150
K. TOTAL COSTS (I +J)		214,474	212,858	201,854	629,186

APPENDIX A. Detailed Budget
Investigator Group: II

Funds Requested From CALFED

	<u>% Effort</u>	<u>YEAR 1</u> <u>('97-'98)</u>	<u>YEAR 2</u> <u>('98-'99)</u>	<u>YEAR 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigator(s)					
a. Samual Luoma (GS 15)	5 of 20	5,410	5,410	5,410	16,230
b. Robin Bouse (GS 11)	70	30,000	31,000	32,000	93,000
c. Byeong-Gweon Lee (GS 12)	100	48,886	50,352	51,863	151,101
2. Others					
a. Michelle Hornberger (GS 11)	5 of 40	2,160	2,160	2,160	6,480
b. Cynthia Brown (GS 11)	5 of 20	2,160	2,160	2,160	6,480
c. student (GS 7)	50	11,000	11,000	11,000	33,000
TOTAL SALARIES		99,616	102,082	104,593	306,291
B. BENEFITS					
1. Principal Investigator(s)					
a. Samual Luoma (GS 15)		649	649	649	1,948
b. Robin Bouse (GS 11)		6,000	6,200	6,400	18,600
c. Byeong-Gweon Lee (GS 12)		14,666	15,106	15,559	45,330
2. Others					
a. Michelle Hornberger (GS 11)		605	605	605	1,814
b. Cynthia Brown (GS 11)		605	605	605	1,814
c. student (GS 7)		2,500	2,500	2,500	7,500
TOTAL BENEFITS		24,375	25,015	25,669	75,059
C. PERMANENT EQUIPMENT					0
D. EXPENDABLES		10,000	10,000	5,000	25,000
E. TRAVEL		2,000	2,000	2,000	6,000
F. PUBLICATIONS		USGS	USGS	USGS	USGS
G. OTHER COSTS					
TOTAL OTHER COSTS					0
I. TOTAL DIRECT COSTS (A-G)		135,991	139,097	137,262	412,350
J. INDIRECT COSTS (@ 56.5%)		76,835	78,590	77,553	232,978
K. TOTAL COSTS (I +J)		212,827	217,687	214,814	645,328

APPENDIX A. Detailed Budget
Investigator Group: III

Funds Requested from CALFED

	<u>% Effort</u>	<u>YEAR 1</u> <u>('97-'98)</u>	<u>YEAR 2</u> <u>('98-'99)</u>	<u>YEAR 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigator(s)					
a. James Cloern (GS 15)	5 of 20	5,252	5,410	5,572	16,234
2. Others					
a. Postdoctoral Associate (GS 12)	100	48,886	50,352	51,863	151,101
b. Jody Edmunds (GS 9)	5 of 20	1,798	1,852	1,908	5,558
c. Brian Cole (GS 13)	5 of 20	3,585	3,692	3,803	11,080
TOTAL SALARIES		59,521	61,306	63,146	183,973
B. BENEFITS					
1. Principal Investigator(s)					
a. James Cloern (GS 15)		709	730	752	2,192
2. Others					
a. Postdoctoral Associate (GS 12)		14,666	15,106	15,559	45,331
b. Jody Edmunds (GS 9)		539	556	572	1,667
c. Brian Cole (GS 13)		1,075	1,108	1,141	3,324
TOTAL BENEFITS		16,990	17,500	18,024	52,514
C. PERMANENT EQUIPMENT		5,000			5,000
D. EXPENDABLES		7,000	8,000	2,000	17,000
E. TRAVEL		6,000	7,000	3,000	16,000
F. PUBLICATIONS		USGS	USGS	USGS	USGS
G. OTHER COSTS					
TOTAL OTHER COSTS					0
I. TOTAL DIRECT COSTS (A-G)		94,511	93,806	86,170	274,487
J. INDIRECT COSTS (@ 56.5 % of direct costs)		53,399	53,000	48,686	155,085
K. TOTAL COSTS (I + J)		147,910	146,806	134,856	429,572

APPENDIX A. Detailed Budget
Investigator Group: IV

Funds Requested from CALFED

	<u>%Effort</u>	<u>Year 1</u> <u>('97-'98)</u>	<u>Year 2</u> <u>('98-'99)</u>	<u>Year 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigators					
a. George Aiken (Chemist, GS 14)	5 of 30	3,658	3,764	3,764	11,186
b. James Kuwabara (Hydrologist, GS 14)	5 of 30	3,966	3,966	4,076	12,007
2. Others					
a. Brent Topping (Hydrologist, GS7)	5 of 30	1,370	1,414	1,458	4,242
b. Janece Koleis (Hydrologist, GS7)	5 of 20	228	236	243	707
d. Graduate Student, GS7 (Menlo Park)	100	26,755	27,647	28,539	82,941
e. Graduate Student, GS5-7 (Boulder)	100	20,898	25,885	26,748	73,531
f. Oscar Mace (Biologist, GS7)	10	2,676	2,765	2,854	8,294
g. Jane Caffrey (UC Santa Cruz)		4,100	4,100	4,100	12,300
TOTAL SALARIES		63,651	69,776	71,782	205,209
B. BENEFITS					
1. Principal Investigators					
a. George Aiken (Chemist, GS 14)		490	504	504	1,499
c. James Kuwabara (Hydrologist, GS 14)		531	531	546	1,609
2. Others					
a. Brent Topping (Hydrologist, GS7)		411	424	437	1,273
b. Janece Koleis (Hydrologist, GS7)		68	71	73	212
d. Graduate Student, GS7		2,047	2,115	2,183	6,345
e. Graduate Student, GS7		1,599	1,980	2,046	5,625
f. Oscar Mace (Biologist, GS7)		803	829	856	2,488
g. Jane Caffrey (UC Santa Cruz)		1,100	1,100	1,100	3,300
TOTAL BENEFITS		7,049	7,556	7,747	22,351
C. PERMANENT EQUIPMENT					
	Kuwabara >	8,000	-	-	8,000
	Aiken >	5,000	2,500	-	7,500
D. EXPENDABLES					
	Kuwabara >	4,000	4,000	2,000	10,000
	Aiken >	5,000	5,000	1,000	11,000
E. TRAVEL (Personnel and equipment)					
	Kuwabara >	1,000	1,000	2,000	4,000
	Aiken >	7,500	7,500	5,000	20,000
F. PUBLICATIONS					
		500	500	1,000	2,000
G. OTHER					
1. Shipping (Equipment transport)		2,500	2,500	500	5,500
2. Analytical Expenses		5,000	5,000	1,000	11,000
I. TOTAL DIRECT COSTS (A-G)					
		109,199	105,332	92,029	306,560
J. INDIRECT COSTS (56.5% of direct costs)					
		61,698	59,512	51,996	173,206
K. TOTAL COSTS (I + J)					
		170,897	164,844	144,025	479,766

APPENDIX A. Detailed Budget
Investigator Group: V

Funds Requested from CALFED

	<u>% Effort</u>	<u>YEAR 1</u> <u>('97-'98)</u>	<u>YEAR 2</u> <u>('98-'99)</u>	<u>YEAR 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigator(s)					
a. David Krabbenhoft (GS 15)	20%	14,496	14,931	15,378	44,805
2. Others					
Mark Olson (GS 12)	50%	29,250	30,128	31,031	90,409
John Dewild (GS 9)	50%	21,060	21,691	22,343	65,094
Barb Scudder (GS 12)	25%	14,940	15,388	15,850	46,178
Jeff Steuer (GS 11)	10%	6,000	6,180	6,365	18,545
Shane Olund (Student Hourly)	15%	3,840	3,955	4,074	11,869
TOTAL SALARIES		89,586	92,273	95,041	276,900
B. BENEFITS					
1. Principal Investigator(s)					
David Krabbenhoft		2,899	2,986	3,076	8,961
2. Others					
Mark Olson (GS 12)		5,850	6,026	6,206	18,082
John Dewild (GS 9)		4,212	4,338	4,469	13,019
Barb Scudder (GS 12)		2,988	3,078	3,170	9,236
Jeff Steuer (GS 11)		1,200	1,236	1,273	3,709
Shane Olund (Student Hourly)		768	791	815	2,374
TOTAL BENEFITS		17,917	18,455	19,008	55,380
C. PERMANENT EQUIPMENT		10,500			10,500
D. EXPENDABLES		14,125	5,000	3,000	22,125
E. TRAVEL		10,000	10,000	5,000	25,000
F. PUBLICATIONS		2,000	2,000	3,000	7,000
G. OTHER COSTS					
I. TOTAL DIRECT COSTS (A-G)		144,128	127,728	125,049	396,905
J. INDIRECT COSTS (@56.5% of direct costs)		81,432	72,166	70,653	224,251
K. TOTAL COSTS (I +J)		225,561	199,894	195,702	621,156

**APPENDIX A. Detailed Budget
Investigator Group: VI**

Funds Requested from CALFED

	<u>% Effort</u>	<u>YEAR 1 ('97-'98)</u>	<u>YEAR 2 ('98-'99)</u>	<u>YEAR 3 ('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigator(s)					
M.K. Saiki	5 of 25	3,434	3,571	3,714	10,719
2. Others					
Technician (GS 5)	100	21,601	22,321	23,042	66,964
TOTAL SALARIES		25,035	25,892	26,756	77,683
B. BENEFITS					
1. Principal Investigator(s)					
M.K. Saiki		515	536	557	1,608
2. Others					
Technician (GS 5)		6,481	6,697	6,913	20,091
TOTAL BENEFITS		6,996	7,233	7,470	21,699
C. PERMANENT EQUIPMENT		5,000	0	0	5,000
D. EXPENDABLES		5,000	5,000	3,000	13,000
E. TRAVEL		2,500	2,500	2,500	7,500
F. PUBLICATIONS		1,000	1,500	2,000	4,500
G. OTHER COSTS					
I. TOTAL DIRECT COSTS (A-G)		45,531	42,125	41,726	129,381
J. INDIRECT COSTS (@ 56.5 % of direct costs)		25,725	23,800	23,575	73,100
K. TOTAL COSTS (I +J)		71,255	65,925	65,301	202,482

APPENDIX A. Detailed Budget Funds Requested From CALFED
Investigator Group: VII

	<u>% Effort</u>	<u>YEAR 1</u> <u>('97-'98)</u>	<u>YEAR 2</u> <u>('98-'99)</u>	<u>YEAR 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigator(s)					
a. Carol Kendall (Hydrologist, GS-14)	5 of 10	3,952	4,070	4,192	12,214
2. Others					
a. Postdoctoral Associate (GS-12)	50	24,443	25,176	25,932	75,551
b. Cecily Chang (Hydrologist, GS-12)	5 of 10	2,667	2,747	2,829	8,242
b. Technician (GS-6)	50	14,502	14,937	15,385	44,824
TOTAL SALARIES		45,563	46,930	48,338	140,831
B. BENEFITS					
1. Principal Investigator(s)					
a. Carol Kendall (Hydrologist, GS-14)		407	419	432	1,258
2. Others					
a. Postdoctoral Associate (GS-12)		7,333	7,553	7,780	22,665
b. Cecily Chang (Hydrologist, GS-12)		267	275	283	824
b. Technician (GS-6)		1,102	1,135	1,169	3,407
TOTAL BENEFITS		9,109	9,382	9,664	28,154
C. PERMANENT EQUIPMENT		5,000			5,000
D. EXPENDABLES		10,000	11,000	12,000	33,000
E. TRAVEL		2,000	2,000	2,000	6,000
F. PUBLICATIONS		USGS	USGS	USGS	
G. OTHER COSTS					
I. TOTAL DIRECT COSTS (A-G)		71,672	69,311	72,002	212,985
J. INDIRECT COSTS (@ 56.5% of direct costs)		40,495	39,161	40,681	120,336
K. TOTAL COSTS (I +J)		112,166	108,472	112,682	333,321

APPENDIX A. Detailed Budget
Investigator Group: VIII

Funds Requested from CALFED

	<u>% Effort</u>	<u>YEAR 1</u> <u>('97-'98)</u>	<u>YEAR 2</u> <u>('98-'99)</u>	<u>YEAR 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigator(s)					
T. W. May	25	16,038			16,038
T.W. May	10		6,415	6,415	12,830
2. Others					
technician (GS 9)	75	26,350			26,350
technician (GS 9)	40		14,053		14,053
technician (GS 9)	20			7,027	7,027
Contractual technician	50	9,360			9,360
Contractual technician	25		4,680		4,680
Contractual technician	10			1,872	1,872
TOTAL SALARIES		51,748	25,148	15,314	92,210
B. BENEFITS					
1. Principal Investigator(s)					
T. W. May		2,236			2,236
T.W. May			894	894	1,788
2. Others					
technician (GS 9)		9,041			9,041
technician (GS 9)			4,822		4,822
technician (GS 9)				2,411	2,411
Contractual technician		4,847			4,847
Contractual technician			2,423		2,423
Contractual technician				969	969
TOTAL BENEFITS		16,124	8,139	4,274	28,537
C. PERMANENT EQUIPMENT		1,650			1,650
D. EXPENDABLES		10,000	6,400	0	16,400
E. TRAVEL					
F. PUBLICATIONS		500	500	500	1,500
G. OTHER COSTS					
I. TOTAL DIRECT COSTS (A-G)		80,022	40,187	20,088	140,297
J. INDIRECT COSTS (@ 56.5% of direct cost)		45,212	22,706	11,350	79,268
K. TOTAL COSTS (I +J)		125,234	62,893	31,438	219,565

APPENDIX A. Detailed Budget
Investigator Group: IX

Funds Requested from CALFED

	<u>% Effort</u>	<u>YEAR 1</u> <u>('97-'98)</u>	<u>YEAR 2</u> <u>('98-'99)</u>	<u>YEAR 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
1. Principal Investigator(s)					
a. Charles Armor	5	CDFG	CDFG	CDFG	CDFG
2. Others					
a. Boat Operator	3	CDFG	CDFG	CDFG	CDFG
b. Deckhand	3	CDFG	CDFG	CDFG	CDFG
c. Crew	3	CDFG	CDFG	CDFG	CDFG
TOTAL SALARIES		0	0	0	0
B. BENEFITS					
1. Principal Investigator(s)					
a. Charles Armor		CDFG	CDFG	CDFG	CDFG
2. Others					
a. Boat Operator		CDFG	CDFG	CDFG	CDFG
b. Deckhand		CDFG	CDFG	CDFG	CDFG
c. Crew		CDFG	CDFG	CDFG	CDFG
TOTAL BENEFITS		0	0	0	0
C. PERMANENT EQUIPMENT		CDFG	CDFG	CDFG	CDFG
D. EXPENDABLES		CDFG	CDFG	CDFG	CDFG
E. TRAVEL		CDFG	CDFG	CDFG	CDFG
F. PUBLICATIONS					0
G. OTHER COSTS*		2,000	1,035	1,030	4,065
I. TOTAL DIRECT COSTS (A-G)		2,000	1,035	1,030	4,065
J. INDIRECT COSTS (@ 23% of direct costs)		460	238	237	935
K. TOTAL COSTS (I + J)		2,460	1,273	1,267	5,000

* Supplemental funds requested for additional sampling, above and beyond CDFG's routine sampling effort, that may be needed to fulfill the minimal fish catch per region (n=10-20) requirement anticipated for this project.

APPENDIX A. Detailed Budget
Investigator Group: Boat-2

Funds Requested from CALFED
Frontier (25' Whaler w/ Cabin)

	<u>% Effort</u>	<u>YEAR 1</u> <u>('97-'98)</u>	<u>YEAR 2</u> <u>('98-'99)</u>	<u>YEAR 3</u> <u>('99-'00)</u>	<u>TOTAL</u>
A. SALARIES					
a. Hydrologic Field Tech (GS 9)	100	33,712	34,723	17,883	86,318
TOTAL SALARIES		33,712	34,723	17,883	86,318
B. BENEFITS					
a. Hydrologic Field Tech (GS 9)		10,114	10,417	5,365	25,895
TOTAL BENEFITS		10,114	10,417	5,365	25,895
C. PERMANENT EQUIPMENT					
D. EXPENDABLES		6,000	7,000	3,500	16,500
E. TRAVEL		4,000	4,000	2,000	10,000
F. PUBLICATIONS					
G. OTHER COSTS*					
I. TOTAL DIRECT COSTS (A-G)		53,826	56,140	28,747	138,713
J. INDIRECT COSTS (@ 56.5% of direct costs)		30,411	31,719	16,242	78,373
K. TOTAL COSTS (I +J)		84,237	87,859	44,989	217,085

APPENDIX B.
Curriculum Vitae for Individual Investigators
(alphabetical)

CURRICULUM VITAE: George Aiken

U.S. Geological Survey, 3215 Marine St., Boulder, CO 80303
Phone: (303) 541-3063 , Fax: (303) 447-2505 graiken@servcolkr.cr.usgs.gov

Education

Colorado School of Mines, Ph.D. 12/91, Applied Chemistry
University of Colorado, M.S. 6/79, Analytical Chemistry
Rutgers, The State University, B.A. 6/73, Chemistry

Professional experience

Project Chief National Research Program, Water Resources Division, U. S. Geological Survey (presently)
National Research Program, U.S. Geological Survey, WRD, since January 1981. Conducting research on the analysis and chemistry of naturally occurring organic compounds aquatic systems.
Research Assistant, Dartmouth College 1/80-12/80. Studied effects of acid rain on soil chemistry in the Adirondacks.
National Research Program, U.S. Geological Survey, WRD, 1/76-12/79. Conducted research on chromatographic techniques for isolating humic substances from water, also studied the movement of organic solutes in groundwater and the effects of humic substances on water purification.

Professional societies

American Chemical Society
American Geophysical Union
Phi Lambda Upsilon, Honorary Chemical Society

Awards and honors

USGS Sustained Special Achievement Award, 1988

Relevant Publications

- Aiken, G. R., McKnight, D. M., Thorn, K. A., and Thurman, E. M., 1992, Isolation of hydrophilic acids from water using macroporous resins. *Organic Geochemistry*, vol. 18, pp. 567-573.
- McKnight, D. M., Bencala, K. E., Zellweger, G. W., Aiken, G. R., Feder, G. L., and Thorn, K. A., 1992, Sorption of dissolved organic material by hydrous aluminum and iron oxides occurring at the confluence of Deer Creek with the Snake River, Summit County, Colorado: *Environmental Science and Technology*, vol. 26, pp. 1388-1396.
- Aiken, G., Capel, P., Furlong, E., Hult, M. and Thorn, K., 1992, Mechanisms controlling the fate and transport of organic chemicals in groundwater. In Mallard, G. E., and Aronson, D. A., eds., U. S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11-15, 1991, Water Resources Investigations Report 91-4034, pp. 633-637.
- Wershaw, R. L., Aiken, G. R., and Imbrigiotta, T. E., 1992, Characterization of high molecular weight colored compounds in groundwater at the Picatinny Arsenal, New Jersey: In Mallard, G. E., and Aronson, D. A., eds., U. S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Monterey, California, March 11-15, 1991, Water Resources Investigations Report 91-4034, pp. 726-730.
- Goldberg, M. C., Cunningham, K. M., Aiken, G. R. and Weiner, E. R., 1992, The aqueous photolysis of apinene in solution with humic acid: *Journal of Contaminant Hydrology*, vol. 9, pp. 79-89.
- Aiken, G. R., 1992, Chloride interference in the analysis of dissolved organic carbon by the wet oxidation method: *Environmental Science and Technology*, vol. 26, pp. 2435-2439.

- McKnight, D. M., **Aiken, G. R.**, Andrews, E. D., Bowles, E. C., and Harnish, R. A., 1993, Dissolved organic material in Dry Valley Lakes: A comparison of Lake Fryxell, Lake Hoare, and Lake Vanda. *In* Dry Valley Lakes, W. J. Green, ed., American Geophysical Union Monograph, vol. 59, 119-133.
- Aiken, G. R.** and Leenheer, J. A., 1993, Isolation and characterization of dissolved and colloidal organic matter, *Chemistry and Ecology*, vol. 8, pp. 135-151.
- Chin, Y., **Aiken, G.** and O'Loughlin, E., 1994, On the molecular weight, polydispersity and spectroscopic properties of aquatic humic substances, *Environmental Science and Technology*, vol. 28, pp. 1853-1858.
- Wershaw, R. L., **Aiken, G. R.**, Imbrigotta, T. E., and Goldberg, M. C., 1994, Displacement of soil pore water by trichloroethylene: *Journal of Environmental Quality*, Vol. 23, pp. 792-798.
- McKnight, D. M., Andrews, E. D., Spaulding, S. A., and **Aiken, G. R.**, 1994 Aquatic fulvic acids in algal rich antarctic ponds and comparison with samples from other environments: *Limnology and Oceanography*, Vol. 39, pp. 1972-1979.
- Aiken, G. R.**, McKnight, D. M., Wershaw, R. L., and Harnish, R., 1996, Geochemistry of aquatic humic substances in the Lake Fryxell basin, Antarctica: *Biogeochemistry*, Vol. 34, pp. 157-188.
- Miller, L. G. and **Aiken, G. R.**, 1996, Stable isotope and tritium hydrology of Lake Fryxell, Taylor Valley, Antarctica: *Limnology and Oceanography*, Vol. 41, p. 966-976.
- Aiken, G. R.**, 1996, Studies on the molecular size of dissolved organic carbon fraction downgradient of the oil body at Bemidji, Minnesota, *In* Morganwalp, D.W., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Colorado Springs, Colorado, September 20-24, 1993: U.S. Geological Survey Water-Resources Investigations Report 94-4014.
- Cozzarelli, I. M., Baedecker, M. J., **Aiken, G.** and Phinney, C., 1996, Small scale chemical heterogeneities in a crude oil contaminated aquifer, Bemidji, Minnesota, *In* Morganwalp, D.W., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Colorado Springs, Colorado, September 20-24, 1993: U.S. Geological Survey Water-Resources Investigations Report 94-4014.
- Metge, D. W., Harvey, R. W., **Aiken, G. R.**, and Barber, L. B., 1996, Use of static column experiments to identify factors affecting bacterial attachment in contaminated aquifer sediments from Cape Cod, Massachusetts, *In* Morganwalp, D.W., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the Technical Meeting, Colorado Springs, Colorado, September 20-24, 1993: U.S. Geological Survey Water-Resources Investigations Report 94-4014.
- Reddy, M., **Aiken, G.**, Schuster, P., Gunther, C., Charlton, S., and Tregellas, J. 1996, Summary of Data from On site and Laboratory Analyses of Surface Water and Marsh Porewater from South Florida Water Management District Water Conservation Areas, the Everglades, South Florida, March, 1995 U. S. Geological Survey Water Supply, electronic distribution on World Wide Web.
- Reddy, M. M., Schuster, P. F., Gunther, C., Charlton, S., and **Aiken, G.** 1996, Summary of major ion chemical data from onsite and laboratory analysis of groundwater samples from the surficial and deep artesian aquifers, Las Vegas, Nevada, April and August 1993, U. S. Geological Survey Water Supply, electronic distribution on World Wide Web.
- Breault, R. F., Colman, J.A., **Aiken, G.R.**, and McKnight, D. M., 1996, Copper speciation and binding by organic matter in stream water: *Environmental Science and Technology*, Vol.30, pp.3477-3486.

CURRICULUM VITAE: Charles Armor

Bay-Delta and Special Water Projects Division, CA Dept. of Fish and Game
4001 North Wilson Way, Stockton, CA 95205
(209) 948-7800, Fax: (209) 946-6355, carmor@delta.dfg.ca.gov

Education

M.A. Biological Sciences, 1976, California State University, Chico
B.A. Biological Sciences, 1971, California State University, Chico

Professional Experience

Senior Biologist - Supervisor, 1991 to present, CA Dept. of Fish and Game, Stockton, CA
Associate Fishery/Marine Biologist, 1985-1991, CA Dept. of Fish and Game, Stockton, CA
Biologist, Fishery/Marine, 1980-1985, CA Dept. of Fish and Game, Stockton, CA
Water Quality Biologist, 1977-1979, CA Dept. of Fish and Game, Long Beach, CA

Research Interests

Estuarine fish and macro invertebrate community dynamics

Memberships

American Fisheries Society 1980-present
Estuarine Research Federation 1984-present

Relevant Publications

Jassby, A. D., W. J. Kimmerer, S. G. Monismith, C. Armor, J. E. Cloern, T. M. Powell, J. R. Schubel and T. J. Vendlinski. 1995. Isohaline position as a habitat indicator for estuarine populations. *Ecol. Appl.* 5:272-289.

California Department of Fish and Game. 1992. Estuary dependent species. Exhibit 6, entered for the State Water Resources Control Board 1992 Water Quality/Water Rights Proceedings on the San Francisco Bay and Sacramento-San Joaquin Delta. 97 pp.

California Department of Fish and Game. 1987. Delta outflow effects on the abundance and distribution of San Francisco Bay fish and invertebrates, 1980-1985. Exhibit 60, entered for the State Water Resources Control Board 1987 Water Quality/Water Rights Proceeding on the San Francisco Bay and Sacramento-San Joaquin Delta, 345 pp.

Aarmor, C. and P. L. Herrgesell. 1985. Distribution and abundance of fishes in the San Francisco Bay estuary between 1980 and 1982. *Hydrobiologia* 129:211-227.

CURRICULUM VITAE: Robin M. Bouse

U.S. Geological Survey, 345 Middlefield Rd., MS 465, Menlo Park, CA 94025
Phone: (415) 329-4448, FAX (415) 329-4463, rmbouse@usgs.gov

Education

University of Arizona, Tucson AZ, Ph.D. in Geosciences, 1995
University of Rhode Island, Kingston, RI, M.S. in Geology, 1988
Duke University, Durham, NC, B.S. in Geology, 1981

Professional Experience

Physical Scientist, USGS, Water Resources Division, Menlo Park, CA, 1994 to present
Geochemist, Branch of Isotope Geology, USGS, Geologic Division, Menlo Park, CA, 1990-1993
Geologist, Branch of Atlantic Marine Geology, USGS, Geologic Division, Woods Hole, MA, 1986-1990
Physical Science Technician, Branch of Pacific Marine Geology, USGS, Geologic Division, Menlo Park, CA, 1981-1986

Memberships in Professional Societies

American Geophysical Union, 1988 to present
Geological Society of America, 1984 to present

Relevant Publications

- Bouse, R. M., Hornberger, M. I., and Luoma, S. N., 1996, Sr and Nd compositions and trace element concentrations in San Francisco Bay cores distinguish sediment deposited from hydraulic gold-mining and mercury mining: (Abstract) Eos, Transactions, American Geophysical Union 1996 Fall Meeting, v. 77, p. 201.**
- Bouse, R. M., Hornberger, M. I., and Luoma, S. N., 1996, Geochemical signatures from mercury mining and hydraulic gold-mining in San Francisco Bay sediments, (Abstract) Third Biennial State of the Estuary Conference, San Francisco, p. 41.**

CURRICULUM VITAE: JAMES E. CLOERN

U.S. Geological Survey, MS 496, 345 Middlefield Rd., Menlo Park, CA 94025
telephone: 415-329-4594, FAX: 415-329-4327, email: jecloern@usgs.gov

Education

University of Wisconsin-Madison, B.S. 1970, Zoology
University of Wisconsin-Milwaukee, M.S. 1973, Zoology
Washington State University, Ph.D. 1976, Zoology

Research and Professional Experience

1976-present	Research Scientist, U.S. Geological Survey, Menlo Park, CA
1997	Lecturer, University of California-Santa Cruz
1997	Consulting Professor, Stanford University
1993-1994	Directeur de Recherche, Université d'Aix-Marseille, France

Research Interests

Ecology and biogeochemistry of estuaries and lakes, with focus on phytoplankton. Team leader of a 20-year investigation of San Francisco Bay that has included study/measurement of: primary production, algal and zooplankton community dynamics, net ecosystem metabolism, the carbon budget, light and nutrient limitation of algal growth, grazing by benthic suspension feeders, disturbance by introduced species, impacts of climatic/hydrologic variability, phytoplankton bloom dynamics, biogeochemical significance of algal blooms, benthic and pelagic nutrient regeneration, use of stable isotopes and lipid biomarkers to characterize sources of organic matter, variability at time scales from hours to decades and spatial scales from meters to kilometers.

Highlights

Steering Committee, 1997 Aquatic Sciences Meeting, Santa Fe
Fulbright Research Scholar, 1993-94 (Centre d'Océanologie de Marseille)
U.S. Department of Interior Meritorious Service Award, 1991
Editorial Board, *Limnology and Oceanography*, 1989-1992
Associate Editor, *Estuaries*, 1989-1994
Program Chair, 1991 Estuarine Research Federation Meeting, San Francisco
National Science Foundation Advisory Panels for Ocean Sciences Research, 1988, 1992

Relevant Publications

- Cloern, J.E., 1991, Tidal stirring and phytoplankton bloom dynamics in an estuary: *Journal of Marine Research*, v. 49, p. 203-221.
- Alpine, A.E., and Cloern, J.E., 1992, Trophic interactions and direct physical effects control phytoplankton biomass and production in an estuary: *Limnology and Oceanography*, v. 37, p. 946-955.
- Jassby, A.D., Cloern, J.E., and Powell, T.M., 1993, Organic carbon sources and sinks in San Francisco Bay: variability induced by river flow: *Marine Ecology Progress Series*, v. 95, p. 39-54.
- Canuel, E.A., Cloern, J.E., Ringelberg, D., Guckert, J., and Rau, G., 1995, Molecular and isotopic tracers used to understand sources of organic matter and trophic relationships in the San Francisco Bay estuary: *Limnology and Oceanography*, v. 40, p. 67-81.
- Cloern, J.E., 1996, Phytoplankton bloom dynamics in coastal ecosystems: A review with some general lessons from sustained investigation of San Francisco Bay, California: *Reviews of Geophysics*, Vol. 34, No. 2, p. 127-168.
- Jassby, A.D., Cole, B.E., and Cloern, J.E., 1997, Towards the design of sampling networks for characterizing water quality change in estuaries: *Estuarine, Coastal and Shelf Science* (in press).

CURRICULUM VITAE: Carol Kendall

United States Geological Survey, 345 Middlefield Road, Menlo Park, CA 94025
tel: 415-329-4576, fax: 415-329-5590, e-mail: ckendall@usgs.gov

Education

Ph.D., Geology, 1993, University of Maryland, College Park
M.S., Geology, 1976, University of California, Riverside
B.S., Geology, 1973, University of California, Riverside

Professional Experience

1990 to Present: Project Chief: Isotope tracers of hydrologic and biogeochemical processes, USGS, WRD, Menlo Park, CA.
1980-1990: Research Hydrologist in Isotope Fractionation Project, USGS, WRD, Reston, VA.
1976-1979: Geochemist at the Department of Geology, California Institute of Technology.
1973-1976: Staff research associate at the Institute of Geophysics and Planetary Physics, University of California, Riverside.

Research Interests

watershed biogeochemistry, tracing sources of nutrients and pollutants using stable isotopic methods, stormflow runoff mechanisms, foodweb determinations

Memberships

AGU (1985-present; member of Water Quality Committee, 1991-present; Chair, 1995-1997)

Relevant Publications

Kendall, C., Mast, A.M., and Rice, K.C., 1992, Tracing watershed weathering reactions with Delta C-13, In: Kharaka, Y.K., and Maest, A.S. (eds), Proceedings of the 7th International Symposium on Water-Rock Interactions, Park City, Utah, July 13-18, 1992, p. 569-572.

Kendall, C. and McDonnell, J.J., 1993, Effect of intrastorm heterogeneities of rainfall, soil water and groundwater on runoff modeling, In: Peters, N.E. et al. (eds) Tracers in Hydrology, Intern. Assoc. of Hydrol. Sc. Pub. #215, July 11-23, 1993, Yokohama, Japan, p. 41-49.

Krabbenhoft, D.P., Bowser, C.J., Kendall, C., and Gat, J.R., 1994, Use of oxygen-18 and deuterium to assess the hydrology of ground-water/lake systems, In: Baker, L.A. (ed.) Environmental Chemistry of Lakes and Reservoirs, American Chemical Society Advances in Chemistry Series #237, p. 67-90.

Kendall, C., Campbell, D.H., Burns, D.A., Shanley, J.B., Silva, S.R., and Chang, C.C.Y., 1995, Tracing sources of nitrate in snowmelt runoff using the oxygen and nitrogen isotopic compositions of nitrate: In: Tonnessen, K. et al (eds) Biogeochemistry of Seasonally Snow-covered Catchments, Intern. Assoc. of Hydrol. Sc. Pub., July 11-12, 1995, Boulder, CO, p. 339-347.

Kendall, C., Sklash, M.G., and Bullen, T.D., 1995, Isotope tracers of waters and solute sources in catchments, In: Trudgill, S.T., (ed), Solute Modeling in Catchment Systems, Chapter 10, John Wiley, p. 261-303.

Bullen, T.D., Krabbenhoft, D.P., and Kendall, C., 1996, Kinetic and mineralogic controls on the evolution of groundwater chemistry and $^{87}\text{Sr}/^{86}\text{Sr}$ in a sandy silicate aquifer, northern Wisconsin, *Geochem. Cosmoch. Acta*, v. 60, p. 1807-1821.

Bullen, T.D., and Kendall, C., Tracing weathering reactions and water flowpaths: a multi-isotope approach, In: Kendall, C. and McDonnell, J.J. (eds) In: Isotope Tracers in Catchment Hydrology, Chapter 19, Elsevier, 50 pp., (in press).

Kendall, C., Sources and cycling of nitrogen, In: **Kendall, C.** and McDonnell, J.J. (eds) In: Isotope Tracers in Catchment Hydrology, Chapter 17, Elsevier, 60 pp., (in press).

CURRICULUM VITAE: David P. Krabbenhoft

U.S. Geological Survey, Water Resources Division, 8505 Research Way, Madison, Wisconsin 53562
phone: 608-821-3843, fax: 608-821-3817, dpkrabbe@usgs.gov

Education

- 1988 Univ. of Wisconsin - Madison, Ph.D., Hydrogeology/Geochemistry (major) Civil Engineering (minor)
1984 University of Wisconsin - Madison, M.S., Geochemistry (major)
1982 North Dakota State University, B.S., Geology (major) Chemistry (minor)

Professional Experience

- Research Hydrologist, July 1988 to present. USGS, WRD, Madison, Wisconsin.
Associate Editor, *Water Resources Research* (Published by the American Geophysical Union) October, 1993 to October 1996.
Assistant Professor, Wright State University, Dayton, Ohio, January to July 1987. Served as an adjunct assistant professor during a sabbatical leave.

Research Interests

General interests in environmental chemistry, with specific interests in the biogeochemistry of mercury in the environment.

Memberships

- Sigma Xi (1987 to present).
National Well Water Association (1984 to present)
American Geophysical Union (1986 to present)

Relevant Publications

- Krabbenhoft, D.P., and C.L. Babiarz, 1992, Role of groundwater transport in aquatic mercury cycling, *Water Resources Research*, vol. 28, no. 12, 3119-3128.
- Hurley, J.P., Krabbenhoft, D.P., Babiarz, C.L., and Andren, A.W., 1994, Cycling processes of mercury across sediment/water interfaces in seepage lakes, in Baker, L.A. ed., *Environmental Chemistry of Lakes and Reservoirs: Advances in Chemistry Series*, American Chemical Society, Washington, D.C., pp. 426-449.
- Krabbenhoft, D.P., J.M. Benoit, C.L. Babiarz, J.P. Hurley, and A.W. Andren, 1995, Mercury Cycling in the Allequash Creek Watershed, *Water, Air, and Soil Pollution*, v. 80, p. 425-433.
- D.P. Krabbenhoft, C.C. Gilmour, J.M. Beniot, C.L. Babiarz, A.W. Andren, and J.P. Hurley, 1997, Methylmercury Dynamics in Littoral Sediments of a Temperate Seepage Lake, (manuscript in press at *Canadian Journal of Fisheries and Aquatic Sciences*)
- D.P. Krabbenhoft, J.P. Hurley, M.L. Olson, and L.B. Cleckner, 1997, Diurnal Variability of Mercury Phase and Species Distributions in the Florida Everglades, (manuscript accepted at *Biogeochemistry*).
- Hurley, J.P., D.P. Krabbenhoft, L.B. Cleckner, M.L. Olson, G. Aiken, and P.J. Rawlik, 1997, System controls on aqueous mercury distribution in the northern Everglades (manuscript accepted at *Biogeochemistry*).
- Olson, M.L., D.P. Krabbenhoft, J.P. Hurley, and L.B. Cleckner, Resolution of matrix effects on analysis of total and methyl mercury in aqueous samples from the Florida Everglades, (manuscript accepted at *Journal of Analytical Chemistry*)

CURRICULUM VITAE: James S. Kuwabara

U.S. Geological Survey, 345 Middlefield Road, MS 439, Menlo Park, CA 94025

Phone: (415) 329 4485, Fax: (415) 329-4463, kuwabara@usgs.gov

Education

Ph.D. Environmental Engineering Science, 1980, California Institute of Technology, Pasadena, CA

M.S. Environmental Engineering Science, 1976, California Institute of Technology, Pasadena, CA

B.S. Civil Engineering, 1975, University of Hawaii, Honolulu, HI

Professional Experience

Hydrologist, 1982-present, U.S. Geological Survey, Menlo Park, CA

NRC Postdoc, 1980-1982, U.S. Geological Survey, Menlo Park, CA

NSF Graduate Fellow, 1976-1980, California Institute of Technology, Pasadena, CA

Research Interests

trace metal speciation and toxicity; process-interdependent solute transport models

Memberships

Estuarine Research Federation (1991- present)

American Geophysical Union (1982-present)

American Society of Civil Engineers (1984-present)

Physiological Society of America (1980-present)

Relevant Publications

Kuwabara, J.S., Chang, C.C.Y., Khechfe, A.I. and Hunter, Y.R., 1996, Importance of dissolved sulfides and organic substances in controlling the chemical speciation of heavy metals in San Francisco Bay, in Hollibaugh, J.T., ed., San Francisco Bay - the Ecosystem: American Association for the Advancement of Science, Pacific Division, San Francisco, p. 157-172.

Caffrey, J., Hammond, D., **Kuwabara, J.**, Miller, L. and Twilley, R., 1996, Benthic processes in San Francisco Bay: the role of organic inputs and bioturbation, in Hollibaugh, J.T., ed., San Francisco Bay - the Ecosystem: American Association for the Advancement of Science, Pacific Division, San Francisco, p. 425-442.

Kuwabara, J.S., Hunter, Y.R. and Chang, C.C.Y., 1996, Distributions and benthic flux of dissolved sulfides in the oxic water column of San Francisco Bay, California, in Morganwalp, D.W., and Aronson, D.A., eds., U.S. Geological Survey Toxic Substances Hydrology Program -- Proceedings of the Technical Meeting, Colorado Springs, Colorado, September 20-24, 1993: U.S. Geological Survey Water-Resources Investigations Report 94-4015, p. 747-751.

Wood, T.M., Baptista, A.M., **Kuwabara, J.S.** and Flegal, A.R., 1995, Diagnostic modeling of trace metal partitioning in south San Francisco Bay: Limnology and Oceanography, v. 40, p. 345-358.

Hunter, Y.R. and **Kuwabara, J.S.**, 1994, Ionic strength and DOC determinations from various freshwater sources to the San Francisco Bay: Bulletin of Environmental Contamination and Toxicology, v. 52, p. 311-318.

Kuwabara, J.S. and Baker, J.E., 1993, Trace contaminants and nutrients in estuaries: The importance of process interdependence : Estuaries, v. 16, p. 383-384.

Kuwabara, J.S. and Luther, G.W., III, 1993, Dissolved sulfides in the oxic water column of San Francisco Bay, California: Estuaries, v. 16, p. 567-573.

Kuwabara, J.S. and Harvey, R.W., 1990, Application of a hollow-fiber tangential-flow device for sampling suspended bacteria and particles from natural waters: Journal of Environmental Quality, v. 19, p. 625-629.

Kuwabara, J.S., Chang, C.C.Y., Cloern, J.E., Fries, T.L., Davis, J.A. and Luoma, S.N., 1989, Trace metal associations in the water column of South San Francisco Bay, California: *Estuarine Coastal and Shelf Science*, v. 26, p. 307-325.

Chang, C.C.Y., Davis, J.A. and **Kuwabara, J.S.**, 1987, Adsorption of Zn(II) onto TiO₂ in defined media with low suspended particle concentrations: *Estuarine Coastal and Shelf Science*, v. 24, p. 419-424.

CURRICULUM VITAE: Lee, Byeong-Gweon

USGS, WRD, MS 465, 345 Middlefield Rd. Menlo Park, CA94025

Phone: 415-329-4466, Fax: 415-329-5590, bglee@usgs.gov

Education

Ph.D. Coastal Oceanography, 1993; State University of New York (SUNY), Stony Brook

M.S. Marine Environmental Science Program, 1990; SUNY, Stony Brook, NY

Professional Experience

Postdoctoral Associate, 1993- present, USGS, Menlo Park, CA-SUNY, Stony Brook, NY

Research Assistant, 1986-1993, Research Foundation of SUNY, Stony Brook, NY

Research Interests

Trace metal biogeochemistry, bioaccumulation and trophic transfer of metals

Memberships

American Society of Limnology and Oceanography, 1990 - present

American Geophysical Union, 1994-present

American Chemical Society, 1996-present

Relevant Publications

Lee, B.-G. and N. Fisher. 1992. Degradation and elemental release rates from phytoplankton debris and their geochemical implications. *Limnol. Oceanogr.* **37**: 1345-1360.

Lee, B.-G. and N. Fisher. 1992. Decomposition and release of elements from zooplankton debris. *Mar. Ecol. Prog. Ser.* **88**: 117-128.

Lee, B.-G. and N. Fisher. 1993. Release rates of trace elements and protein from decomposing planktonic debris. 1. Phytoplankton debris. *J. Mar. Res.* **51**: 391-421.

Lee, B.-G. and N. Fisher. 1993. Microbially mediated cobalt oxidation in seawater revealed by radiotracer experiments. *Limnol. Oceanogr.* **38**: 1593-1602.

Lee, B.-G. and N. Fisher. 1994. Effects of sinking and zooplankton grazing on the release of elements from decomposing planktonic debris. *Mar. Ecol. Prog. Ser.* **110**: 271-281.

Wang, W.-X., J.R. Reinfelder, B.-G. Lee, and N.S. Fisher. 1996. Assimilation and regeneration of trace elements by marine copepods. *Limnol. Oceanogr.* **41**: 70-81.

Luoma, S.N., A. van Geen, B.-G. Lee, and J.E. Cloern. submittd. Metal uptake by phytoplankton during a bloom in south San Francisco Bay: Implications for metal cycling in estuaries. *Limnol. Oceanogr.*

Lee, B.-G. and S.N. Luoma. submitted. Bioavailability of Cd, Cr, and Zn to bivalves in south San Francisco Bay. *Limnol. Oceanogr.*

CURRICULUM VITAE: SAMUEL N. LUOMA

US Geological Survey, MS465, 345 Middlefield Road, Menlo Park, CA 94025

Phone: (415) 329-4481, Fax: (415) 329-4545, snluoma@usgs.gov

Highest Education

1972-74 PhD Marine Biology, Dept. of Zoology, University of Hawaii, Honolulu, HI.

Recent Professional Experience

1976 - , Project Chief, Water Resources Division, US Geological Survey, Menlo Park, CA

1985-87, Chief, Branch of Western Region Research, WRD, USGS Menlo Park,

1992 - , Senior Research Hydrologist (ST-3104-1) USGS, WRD, Menlo Park, CA

Research Interests

Trace element bioavailability, trophic transfer and effects in estuaries. SF Bay Ecosystem studies.

Recent Selected Experience

1989 Department of Interior Distinguished Service Award

1990- Editorial Advisor: *Marine Ecology Progress Series*

1991-93 Society Environmental Toxicology and Chemistry - Board of Directors

1992- USEPA Science Advisory Board Subcommittee on Sediment Quality Criteria

1993- Editor, *Marine Environmental Research*

1994- Chair, Science Advisory Group, Interagency Ecological Studies Program, S F Bay

1994- Chair, Science Advisory Committee, Water Res. Div., USGS/Senior Staff, WRD, USGS

1994- Sci. Advisory Committee, Center for Environmental Health Research, Univ. Calif. Davis

1994- Comm. Science Advisors, San Francisco Estuary Institute

Invited Participation

Book reviews (4), invited chapters for books (7), Text: *Introduction to Environmental Issues*, 1984, Macmillan Publishing Co.

Frequent invited talks or plenary lectures to scientific or public audiences. Frequent invited participation in workshops on contamination problems or SF Bay issues.

Selected Recent Publication

Nichols, F. H., Cloern, J. E., Luoma, S. N., & Peterson, D. H., 1986, The modification of an estuary, *Science*, 231, 567-573.

Luoma, S. N., 1989. Can we determine the biological availability of sediment-bound trace elements? *Hydrobiologia* v. 176/177, 379-396.

Luoma, S. N., C. Johns, N. S. Fisher, N. A. Steinberg, R. S. Oremland, and J. Reinfelder, 1992, Determination of selenium bioavailability to a benthic bivalve from particulate and solute pathways: *Environ. Sci. Technol.* 26: 485 - 491.

Luoma, S. N. and Carter, J. L. 1993. Understanding the toxicity of contaminants in sediments: beyond the bioassay-based paradigm. *Environ. Toxicol. Chem.* 12: 793-796.

Luoma, S. N. and Ho, K. T. 1993, The appropriate uses of marine and estuarine sediment bioassays, p. 193 - 227 in Calow, P., ed. *The Handbook of Ecotoxicology*, Blackwell Scientific, London.

Luoma, S. N. 1995. Limitations to applications of bioassays and toxicity tests. Review invited by the International Union of Pure and Applied Chemistry, p. 610 - 659 in "*Metal Speciation and Bioavailability*" (A. Tessier & D. Turner, eds.), John Wiley & Sons Press, London.

Wang, W.-X., Fisher, N. S. and **S. N. Luoma**, 1996. Kinetic determinations of trace element bioaccumulation in the mussel *Mytilus edulis*. *Mar. Ecol. Prog. Series* 140: 91 - 113.

Luoma, S. N. and Fisher, N. S. Uncertainties in assessing contaminant exposures from contaminated sediments. In *Ecological Risk Assessments of Contaminated Sediments*, C. Ingersoll, G. Biddinger, T. Dillon (eds), SETAC Press, Pensacola (in press).

Luoma, S. N., 1996. The developing framework of marine ecotoxicology: Pollutants as a variable in marine ecosystems? *J. Exptl. Mar. Biol. Ecol.* 200: 29-55.

Overall approximately 110 publications in peer reviewed literature.

CURRICULUM VITAE: Thomas W. May

USGS, Biological Resources Division, Midwest Science Center, 4200 New Haven Road, Columbia, MO 65201.
Phone: (573) 875-5399 X1858, Fax: (573) 876-1896, thomas_may@nbs.gov

Education

M.S., Biological Sciences, 1974, George Washington University, Washington, D.C.
B.S., Chemistry, 1969, University of Alabama, Tuscaloosa, AL.

Professional Experience

Research Chemist, Midwest Science Center, 1 yr, USGS-BRD, Columbia, MO.
Research Chemist, 3 yrs, National Biological Service, Columbia, MO.
Research Chemist, 17 yrs, U.S. Fish and Wildlife Service, Columbia, MO.

Research Interests

Development and refinement of chemical preparation and instrumental methodology for the optimal investigation of elemental environmental contaminants.

Memberships

Society of Environmental Toxicology and Chemistry (1990-present).

Relevant Publications

- Saiki, M.K., D.T. Castleberry, T.W. May, B.A. Martin, and F.N. Bullard. 1995. Copper, cadmium, and zinc concentrations in aquatic food chains from the upper Sacramento River (California) and selected tributaries. *Archives of Environmental Contamination & Toxicology* 29:484-491.
- Waddell, B.; May, T. 1995. Selenium concentrations in the razorback sucker (*Xyrauchen texanus*): substitution of non-lethal muscle plugs for muscle tissue in contaminant assessment. *Archives of Environmental Contamination and Toxicology* 28:321-326.
- Wiedmeyer, R.H.; May, T.W. 1993. Storage characteristics of three selenium species in water. *Archives of Environmental Contamination and Toxicology* 25(1):67-71.
- Coyle, J.J.; Buckler, D.R.; Ingersoll, C.G.; Fairchild, J.F.; May, T.W. 1993. Effect of dietary selenium on the reproductive success of bluegills (*Lepomis macrochirus*) *Environmental Toxicology and Chemistry* 12(3):551-565.
- Saiki, M.K., M.R. Jennings, and T.W. May. 1992. Selenium and other elements in freshwater fishes from the irrigated San Joaquin Valley, California. *Science of the Total Environment* 126:109-137.
- Ingersoll, C.G.; Dwyer, F.J.; May, T.W. 1990. Toxicity of inorganic and organic selenium to *Daphnia magna* (cladocera) and *Chironomus riparius* (diptera) *Environmental Toxicology and Chemistry* 9(9):1171-1181.
- Saiki, M.K.; May, T.W. 1988. Trace element residues in bluegills and common carp from the lower San Joaquin River, California, and its tributaries. *Science of the Total Environment* 74:199-217.
- Wiener, J.G.; Jackson, G.A.; May, T.W.; Cole, B.P. 1984. Longitudinal distribution of trace elements (As, Cd, Cr, Hg, Pb, and Se) in fishes and sediments in the upper Mississippi River. *Contaminants in the Upper Mississippi River - Proceedings of the 15th Annual Meeting of the Mississippi River Research Consortium*:139-170.

CURRICULUM VITAE: Mark C. Marvin-DiPasquale

U.S. Geological Survey, 345 Middlefield Rd., MS 480, Menlo Park, CA 94025
Phone: (415)-329-4442, Fax: (415)-329-4463, mmarvin@usgs.gov

Education

Monroe Community College, Rochester, NY. 1982-85. A.S., Chemistry.
State University of N.Y., Stony Brook, NY. 1985-87. B.S., Chemistry.
University of Maryland, Chesapeake Biological Laboratory, Solomons, MD. 1987-95. Ph.D., Marine and Estuarine Environmental Sciences. Research Focus: Marine Microbial Ecology

Honors

Gloria Glass Scholarship, Monroe Community College. 1984
Chesapeake Bay Yachts Club Association Graduate Award, Univ. Maryland. 1988.
Senatorial Scholarship, Univ. Maryland. 1989-93.
Chesapeake Biological Lab Graduate Student Fellowship, Univ. Maryland. 1990-92.
Amer. Soc. Microbiol., R.W. Saber Fellowship Award, 1993.

Professional Experience

Undergraduate Laboratory Technician, Monroe Comm. Coll., 1983-85.
Graduate Research Assistant, Univ. of Maryland/CBL, 1987-1995.
National Research Council Associate, USGS, Menlo Park, CA, 1995-present.

Research Interests

aquatic microbial ecology, biogeochemistry of estuaries, mercury biogeochemistry

Memberships

American Chemical Society (1988-present)
American Society of Limnology and Oceanography (1989-present)
Oceanography Society (1989-present)
American Society of Microbiology (1990-present)
Estuarine Research Federation (1995-present)

Relevant Publications

Boynton, W.R.; W.M. Kemp, J.M. Barnes, J.J.W. Cowan, S.E. Stammerjohn, L.L. Matteson, F.M. Rolhand, M. Marvin, and J.H. Garber. 1990. Long-term characteristics and trends of benthic oxygen and nutrient fluxes in the Maryland portion of Chesapeake Bay. In: *New Perspectives in the Chesapeake System: A Research and Management Partnership*. Proceedings of a Conference. Chesapeake Research Consortium publication No. 137.

Marvin, M.C., 1995. Controls On The Spatial And Temporal Trends Of Benthic Sulfate Reduction And Methanogenesis Along The Chesapeake Bay Central Channel. Ph.D. Dissertation, University of Maryland, College Park, MD.

Kemp, W.M., E.M. Smith, M. Marvin-DiPasquale, and W.R. Boynton. 1997. Organic carbon balance and net ecosystem metabolism in Chesapeake Bay. *Mar. Ecol. Prog. Ser.* 150: 229-248.

Marvin-DiPasquale, M. and D.G. Capone. 1997. Benthic sulfate reduction along the Chesapeake Bay central channel. I. Spatial Trends and Controls. *Mar. Ecol. Prog. Ser.* (submitted)

Marvin-DiPasquale, M. and R.S. Oremland. 1997. Bacterial methylmercury degradation potentials in Florida Everglades peat sediment. *Biogeochemistry*. (submitted)

CURRICULUM VITAE: Laurence G. Miller

U.S. Geological Survey, MS 465, 345 Middlefield Rd., Menlo Park, CA 94025
Phone: (415)329-4475, Fax: (415)329-4463, LGMILLER@USGS.GOV

Education

MS, Geological Sciences, University of Southern California, Los Angeles
BS, Marine Science, Southampton College, Southampton, NY

Professional Experience

Oceanographer/Chemist, 13 yr., USGS, Menlo Park, CA (present position)
Oceanographer, 3 yr., University of Washington

Research Interests

Microbial Biogeochemistry, Trace Gases, Stable Isotope Geochemistry

Memberships

AAAS 18yrs, AGU 13 yrs, ACS Geochemistry Division 11 yrs

Relevant Publications

- Caffrey J. M., Hammond, D.E., Kuwabara, J.S., **Miller, L.G.**, and Twilley, R.R. 1996. Benthic processes in South San Francisco Bay: The role of organic inputs and bioturbation. In *San Francisco Bay: The Ecosystem*. Ed. J.T. Hollibaugh. AAAS.
- Caffrey J.M. and **Miller, L.G.** 1995. A comparison of two nitrification inhibitors used to measure nitrification rates in estuarine sediments. *FEMS Microbiol. Ecol.* 17, 213-220.
- Oremland, R. S., **Miller, L.G.**, Dowdle, P. Connell, T. And Barkay, T. 1995. Methylmercury oxidative degradation potentials in contaminated and pristine sediments of the Carson River, Nevada. *Appl. Environm. Microbiol.*, 61, 2745-2753.
- Oremland, R.S., **Miller, L.G.**, and Strohmaier, F. E. 1994. Degradation of methyl bromide in anaerobic sediments. *Wnv. Sci. & Technol.*, 28, 514-520.
- Miller, L.G.**, Coutlakis, M.D., Oremland, R.S., and Ward, B.B. 1993, Selective inhibition of ammonium oxidation and nitrification-linked N₂O formation by methyl fluoride and dimethyl ether. *Appl. Environm. Microbiol.*, 59, 2457-2464.
- Kiene, R.P., Oremland, R.S., Catena, A., **Miller, L.G.**, and Capone, D.G. 1986. Metabolism of reduced methylated sulfur compounds in anaerobic sediments and by a pure culture of an estuarine methanogen. *Appl. Environm. Microbiol.*, 52, 1037-1045.
- Hammond, D. E., Fuller, C.C., Harmon, D. Hartman, B. Korosec, M., **Miller, L.G.**, Rea. R., Warren, S., Berrelson, W., and Hager, S.W. 1985. Benthic fluxes in San Francisco Bay. *Hydrobiologia*, 19, 69-90.

CURRICULUM VITAE: Ronald S. Oremland

USGS, Water Resources Division, MS 480, 345 Middlefield Road, Menlo Park, CA 94025
Phone: (415) 329-4482; Fax: (415) 329-4463; roremlan@usgs.gov

Education

PhD, 1976, Marine Microbiology, Rosenstiel School of Marine & Atmospheric Sciences
University of Miami, Florida
BS, 1968, Biology, Rensselaer Polytechnic Institute, Troy, NY

Professional Experience

Project Chief, Microbial Biogeochemistry, USGS, Menlo Park, CA, 20 years
National Research Council Postdoctoral Associate, NASA Ames Research Center, Moffett Field, CA (1 year)
US Naval Reserve, Active duty, 1969 - 1971, salvage & diving officer, USS Utina

Research Interests

microbial biogeochemistry, redox reactions and methylation/demethylation studies on selenium, arsenic, and mercury; formation and destruction of greenhouse gases like methane and other hydrocarbons, halocarbons, and methyl halides; quantification of anaerobic processes (denitrification, sulfate-reduction, methanogenesis); hypersaline/alkaline environments; exobiology.

Memberships

Chairman, Executive Board, International Symposia on Environmental Biogeochemistry
American Society for Microbiology
American Geophysical Union
American Society for Limnology and Oceanography
American Chemical Society

Relevant Publications

Oremland, R.S., and J.P. Zehr. 1986. Formation of methane and carbon dioxide from dimethyl selenide in anoxic sediments and by a methanogenic bacterium. *Appl. Environ. Microbiol.* 52: 1031 - 1036

Zehr, J.P., and R.S. Oremland. 1987. Reduction of selenate to selenide by sulfate-respiring bacteria: Experiments with cell suspensions and estuarine sediments. *Appl. Environ. Microbiol.* 53: 1365 - 1369.

Oremland, R.S., R.P. Kiene, I. Mathrani, M. Whiticar, and D. Boone. 1989. Description of an estuarine methylotrophic bacterium which grows on dimethylsulfide. *Appl. Environ. Microbiol.* 55: 994 - 1002.

Oremland, R.S., J.T. Hollibaugh, A.S. Maest, T.S. Presser, L. Miller, and C. Culbertson. 1989. Selenate reduction to elemental selenium by anaerobic bacteria in sediments and culture: Biogeochemical significance of a novel, sulfate-independent respiration. *Appl. Environ. Microbiol.* 55: 2333 - 2343.

Oremland, R.S., N.A. Steinberg, A.S. Maest, L.G. Miller, and J.T. Hollibaugh. 1990. Measurement of *in situ* rates of selenate removal by dissimilatory bacterial reduction in sediments. *Environ. Sci. Technol.* 24: 1157 - 1164.

Dubrovsky, N.M., J.M. Neil, R. Fuji, R.S. Oremland, and J.T. Hollibaugh. 1990. Influence of redox potential on selenium distribution in ground water, Mendota, Western San Joaquin Valley, California. USGS Open File Report 90-138, Sacramento, CA.

Steinberg, N.A., and R.S. Oremland. 1990. Dissimilatory selenate reduction potentials in a diversity of sediment types. *Appl. Environ. Microbiol.* 56: 3550 - 3557.

Oremland, R.S., C.W. Culbertson, and M.R. Winfrey. 1991. Methyl mercury decomposition in sediments and bacterial cultures: Involvement of methanogens and sulfate reducers in oxidative demethylation. *Appl. Environ. Microbiol.* 57: 130 - 137.

Oremland, R.S., N.A. Steinberg, T.S. Presser, and L.G. Miller. 1991. *In situ* bacterial selenate reduction in the agricultural drainage systems of western Nevada. *Appl. Environ. Microbiol.* 57: 615 - 617.

Steinberg, N.A., J. Switzer Blum, L. Hochstein, and **R.S. Oremland.** 1992. Nitrate is a preferred electron acceptor for growth of freshwater selenate-respiring bacteria. *Appl. Environ. Microbiol.* 58: 426 - 428.

Oremland, R.S., and C.W. Culbertson. 1992. Importance of methane oxidizing bacteria in the methane budget as revealed by the use of a specific inhibitor. *Nature* 356: 421 - 423.

Luoma, S.N., C. Johns, N.S. Fischer, N.A. Steinberg, **R.S. Oremland,** and J.R. Reinfelder. 1992. Determination of selenium bioavailability to a benthic bivalve from particulate and solute pathways. *Env. Sci. Technol.* 26: 485 - 491.

Oremland, R.S. 1994. Biogeochemical transformations of selenium in anoxic environments. p. 389 - 419 in *Selenium in the Environment*, W.T. Frankenberger, Jr. and S. Benson (eds.), Marcel Dekker, NY.

Oremland, R.S., J. Switzer Blum, C.W. Culbertson, P.T. Visscher, L.G. Miller, P. Dowdle, and F.E. Strohmaier. 1994. Isolation, growth and metabolism of an obligately anaerobic, selenate-respiring bacterium, strain SES-3. *Appl. Environ. Microbiol.* 60: 3011 - 3019.

Oremland, R.S., L.G. Miller, P. Dowdle, T. Connell, and T. Barkay. 1995. Methylmercury oxidative degradation potentials in contaminated and pristine sediments of the Carson River, Nevada. *Appl. Environ. Microbiol.* 61: 2745 - 2753.

Laverman, A.M., J. Switzer Blum, J.K. Schaefer, E.J. Philips, D.R. Lovley, and **R.S. Oremland.** 1995. Growth of strain SES-3 with arsenate and other diverse electron acceptors. *Appl. Environ. Microbiol.* 61: 3556 - 3561.

Dowdle, P.R., A.M. Laverman, and **R.S. Oremland.** 1996. Bacterial dissimilatory reduction of arsenic (V) to arsenic (III) in anoxic sediments. *Appl. Environ. Microbiol.* 62: 1664 - 1669.

Stolz, J.F., T. Gugliuzza, J. Switzer Blum, **R. Oremland,** and F.M. Murillo. 1997. Differential expression of cytochromes and reductases in *Geospirillum barnesii* SeS3. *Arch. Microbiol.* 167: 1 - 5.

Over 85 peer-reviewed papers published

CURRICULUM VITAE: Michael K. Saiki

USGS, Biological Resources Division, Northwest Biological Science Center Dixon Duty Station,
6924 Tremont Road, Dixon, CA 95620.

Phone: (916) 756-1946 X617, Fax: (916) 678-5039, michael_saiki@usgs.gov

Education

Ph.D., Biology, 1976, University of Arizona, Tucson.

M.S., Fishery Biology, 1973, University of Arizona, Tucson.

B.A., Zoology, 1971, University of Hawaii, Honolulu.

Professional Experience

Fishery Biologist (Research), 1yr, USGS-BRD, Dixon, CA.

Fishery Biologist (Research), 3yrs, National Biological Service, Dixon, CA.

Fishery Biologist (Research), 15yrs, U.S. Fish and Wildlife Service, Dixon, CA.

Research Interests

Bioaccumulation and toxicity of heavy metals and other trace elements in fish and fish-forage organisms, relation of water quality and other environmental variables to fish distribution and abundance, and life history and ecology of fish.

Memberships

American Fisheries Society (1975-present).

American Institute of Fishery Research Biologists (1988-present).

Society of Environmental Toxicology and Chemistry (1990-present).

Relevant Publications

Saiki, M.K. 1984. Environmental conditions and fish faunas in low elevation rivers on the irrigated San Joaquin Valley floor, California. *California Fish & Game* 70:145-157.

Saiki, M.K., and C.J. Schmitt. 1985. Population biology of bluegills, *Lepomis macrochirus*, in lotic habitats on the irrigated San Joaquin Valley floor. *California Fish & Game* 71:223-244.

Saiki, M.K. 1987. Relation of length and sex to selenium concentrations in mosquitofish. *Environmental Pollution* 47:171-186.

Saiki, M.K., and T.P. Lowe. 1987. Selenium in aquatic organisms from subsurface agricultural drainage water, San Joaquin Valley, California. *Archives of Environmental Contamination & Toxicology* 16:657-670.

Saiki, M.K., and D.U. Palawski. 1990. Selenium and other elements in juvenile striped bass from the San Joaquin Valley and San Francisco Estuary, California. *Archives of Environmental Contamination & Toxicology* 19:717-730.

Saiki, M.K., M.R. Jennings, and R.H. Wiedmeyer. 1992. Toxicity of agricultural subsurface drainwater from the San Joaquin Valley, California, to juvenile chinook salmon and striped bass. *Transactions of the American Fisheries Society* 121:78-93.

Saiki, M.K., M.R. Jennings, and T.W. May. 1992. Selenium and other elements in freshwater fishes from the irrigated San Joaquin Valley, California. *Science of the Total Environment* 126:109-137.

- Saiki, M.K., M.R. Jennings, and W.G. Brumbaugh.** 1993. Boron, molybdenum, and selenium in aquatic food chains from the lower San Joaquin River and its tributaries, California. *Archives of Environmental Contamination & Toxicology* 24:307-319.
- Saiki, M.K., D.T. Castleberry, T.W. May, B.A. Martin, and F.N. Bullard.** 1995. Copper, cadmium, and zinc concentrations in aquatic food chains from the upper Sacramento River (California) and selected tributaries. *Archives of Environmental Contamination & Toxicology* 29:484-491.
- Saiki, M.K., and R.S. Ogle.** 1995. Evidence of impaired reproduction by western mosquitofish inhabiting seleniumiferous agricultural drainwater. *Transactions of the American Fisheries Society* 124:578-587.

NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME

United States Geological Survey

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

OFFICIAL'S NAME

Mark Marvin-DiPasquale

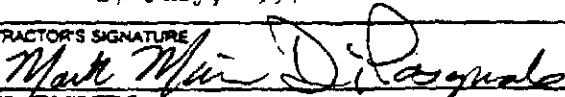
DATE EXECUTED

27 July, 1997

EXECUTED IN THE COUNTY OF

San Mateo

PROSPECTIVE CONTRACTOR'S SIGNATURE



PROSPECTIVE CONTRACTOR'S TITLE

Microbial Ecologist

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

United States Geological Survey

STATE OF CALIFORNIA—THE RESOURCES AGENCY

PETE WILSON, Governor

DEPARTMENT OF FISH AND GAME

Bay-Delta and Special Water Projects Division
4001 North Wilson Way
Stockton, California 95205-2486
(209) 948-7800



July 24, 1997

Mark Marvin-DiPasquale
U.S. Geological Survey
345 Middlefield Road
Bldg. #15, MS 480
Menlo Park, California 94025

Dear Mr. Marvin-DiPasquale:

The Interagency Ecological Program (IEP) via the Delta Outflow/San Francisco Bay Study will provide fish and macro invertebrate samples to the U.S. Geological Survey San Francisco Bay Mercury Project. These samples will consist of specimens collected as a normal part of the IEP Delta Outflow/San Francisco Bay Study monthly sampling program. If this sampling were done as a separate sampling effort the cost would be \$32,000. It is anticipated that the routine sampling will yield all the specimens needed for analysis. Since there is no guarantee that the monthly sampling program will collect all the specimens needed, additional sampling may be required. To cover this contingency, the Bay-Delta and Special Water Projects Division of the California Department of Fish and Game is requesting \$5,000 to cover any additional sampling.

Sincerely,

Charles Armor
Senior Biologist
Bay-Delta and Special Water
Projects Division

CA97G166.wpd:cs/cc

OPTIONAL FORM 28 (7-90)

FAX TRANSMITTAL

of pages 1

To	Mark Marvin-DiPasquale	From	Chuck Armor
Dept./Agency	USGS	Phone	(209) 948-7800
Fax	(415) 329-4463	Fax	(209) 948-6355

NBR 7540-01-317-7362 5099-101 GENERAL SERVICES ADMINISTRATION

UNIVERSITY OF CALIFORNIA, DAVIS

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO



SANTA BARBARA • SANTA CRUZ

DIVISION OF ENVIRONMENTAL STUDIES

DAVIS, CALIFORNIA 95616

23 July 1997

Dr. Mark Marvin-DiPasquale
U.S. Geological Survey
Water Resource Division
Bldg. 15, MS-480
345 Middlefield Rd.
Menlo Park, CA 94025

Dear Dr. Marvin-DiPasquale,

We are pleased to state our strong interest in collaborating with you on your proposed project to CALFED (*The Status of Mercury as a Stressor to Habitats and Species of the San Francisco Bay-Delta Ecosystem*). Your project will be highly complementary with one that we are submitting on mercury loading to the Bay-Delta (*The Role of Upstream Mercury Loading and Speciation on Localized and Downstream Bioaccumulation: A Regional Assessment of Sources and Fates of Mercury Throughout the Bay-Delta Watershed*) by Suchanek and Slotton et al.. We feel that the complementary nature of our collective studies will yield extremely valuable information on the sources of bioavailable mercury from upper watershed regions (our U.C. Davis studies) and the fate of that mercury once it reaches the Bay-Delta system (your U.S.G.S. studies).

In terms of specific areas of collaboration, we have identified two topic areas that we feel would benefit the most from our combined efforts. First, if existing U.S.G.S. cores do not sufficiently provide an accurate depositional history of mercury within Bay-Delta sediments, we are prepared to analyze additional sediment cores to provide those data. Second, in terms of understanding mercury cycling and contamination within the Bay-Delta, your detailed studies involving methylation processes would be extremely useful in interpreting the results of methyl mercury production in our core tube microcosms, allowing the development of more specific options for remediation.

Should both of our projects receiving funding, we are anxious to enter into a collaborative arrangement with your U.S.G.S. group. We feel that the combination of talents within our two groups will result in a synergy that will yield invaluable insights into the cycling of mercury within the Bay-Delta system and ultimately improve the water quality of this impacted ecosystem.

Most sincerely,

A handwritten signature in cursive script, reading "Tom Suchanek".

Tom Suchanek

A handwritten signature in cursive script, reading "Darell Slotton".

Darell Slotton

U.C. Davis Mercury Group